ION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

the TOOL ENGINEER

ASTE

MAY 1954

Production Tapping

Look, Daddy—a steam engine!

THAT's right. Kind of a rare sight these days. Looks like the good old "iron horse" is headed for the last round-up.

Why? Competition mostly. Something *better* came along. Locomotives that were more efficient—less costly to operate and maintain. That's the way it goes. Competition means progress for some things, obsolescence for others.

Naturally you want *your product* to be a success in the competitive days ahead. So you're probably looking right now for new ways to improve quality and cut production costs. That's where we here at Heald may be able to help. New Heald developments in automation, battery-type equipment, way-type and transfer-type Bore-Matics, plus a number of advanced design features, can now be applied to a wide variety of jobs. We'd like to show you what a fresh Heald viewpoint and latest Heald equipment can do—on long or short runs, single or multi-purpose setups.

Competition is wonderful when you're *ahead* of it. Our business is to keep you there. That's why IT PAYS TO COME TO HEALD.

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton
Detroit • Indianapolis • New York

Internal and Rotary Surface Grinding Machines and Bore-Matics

Cover: ...ccessful production ...ng involves the consid...tion of many factors ...h are not usually analy...precisely for small lot ... Such considerations ... the protection of taps ...inst breakage are disc...d in the article beginn...on page 35.

The Tool Engineer

Volume XXXII, No. 5 May 1954

TECHNICAL ARTICLES

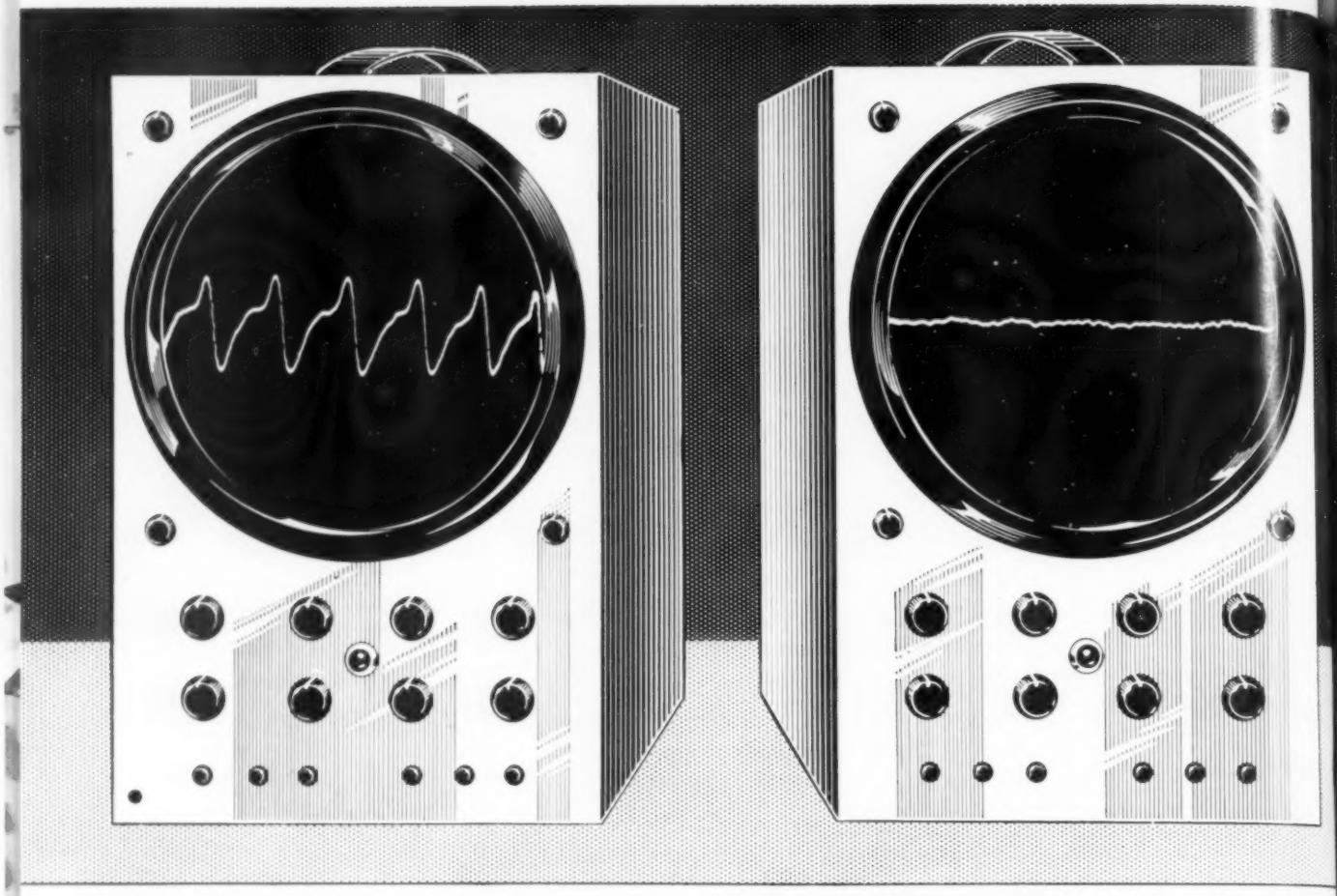
ASTE NEWS

DEPARTMENTS

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

ASTE

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008″ jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-5.

INDUSTRIAL PRODUCTS DEPARTMENT

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THE TOOL ENGINEER

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Publication Office:
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other countries, $8.00 per year.

The Tool Engineer

Dare to Be Right!

When planning a production job, the tool engineer should not limit his thinking to the use of available machines. Through resourcefulness and ingenuity in the past, he has developed better ways to produce almost all of our goods. By not running in the groove of present-day convention, he can achieve even greater accomplishments. For jobs of the future, he should visualize and plan to use production machines of the future.

In developing a new process or method, there is always the risk that it will not be successful. The engineer with ability and the courage of his convictions will dare to be right. And progress will be measured by his footsteps. All that we hold to be American was based on risk. America has forged ahead and will continue to do so in proportion to the vision of engineers, industrialists and statesmen.

Many outstanding production machines have been developed recently and many more are in process of development or refinement. All will leave their mark in our industrial march of progress. THE TOOL ENGINEER watches such developments closely. For instance, during the past eighteen months, the staff has watched with growing interest the progress of what will be an outstanding advance in metal removal—a machine, built for Thompson Products Inc., to perform intricate boring operations on a housing for a J-47 jet-engine compressor in one-twentieth the floor-to-floor time presently required. Members of the staff actually witnessed successful tests of this machine.

All of the engineering and tooling details as well as the necessary approvals, including military, are in the possession of this magazine. The basic article on the process and features of the machine has been prepared for several months and will be completed and published in an up-to-date version as soon as the process has been debugged to the point of proving itself in production. The first complete, authoritative report of this development will be in the pages of THE TOOL ENGINEER—the magazine devoted to serving the men who must dare to be right.

John W. Greve

EDITOR

Now...AT YOUR COMMAND A FULL RANGE OF *Dializers*® PATENTED

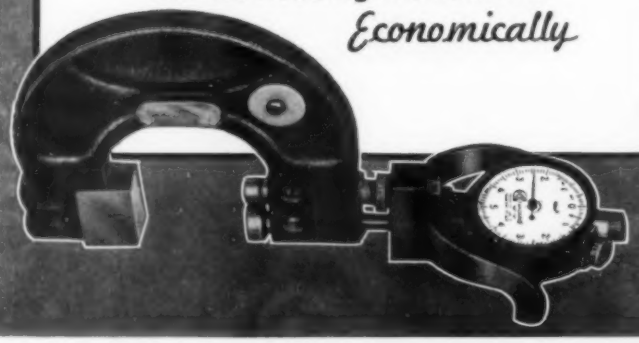
Dializer **instantly converts any AGD Adjustable Limit Snap Gage Frame (and "Standard" Frames larger than AGD) to DIAL Snap Gages**

*E*NTHUSIASTIC USERS, impressed with Dializer performance and adaptability, have insisted that we broaden the range of this practical device. In response, we now make available Dializers with a range of indicators from 1⅛" to 2¼" diameter, graduations of .001", .0001", .0005" and .00025", and a wide variety of dial markings, including metric models.

Get acquainted with this economical, easy way of making your Snap Gages more functional, more valuable, more productive . . . at little cost. Write for details.

Conversion is simply a matter of removing a pair of pins from the Snap Gage and inserting Dializer. Range of adjustment remains the same as before conversion.

You, too, can convert ALL your AGD Adjustable Limit Snap Gages to Dial Reading Instruments *Economically*



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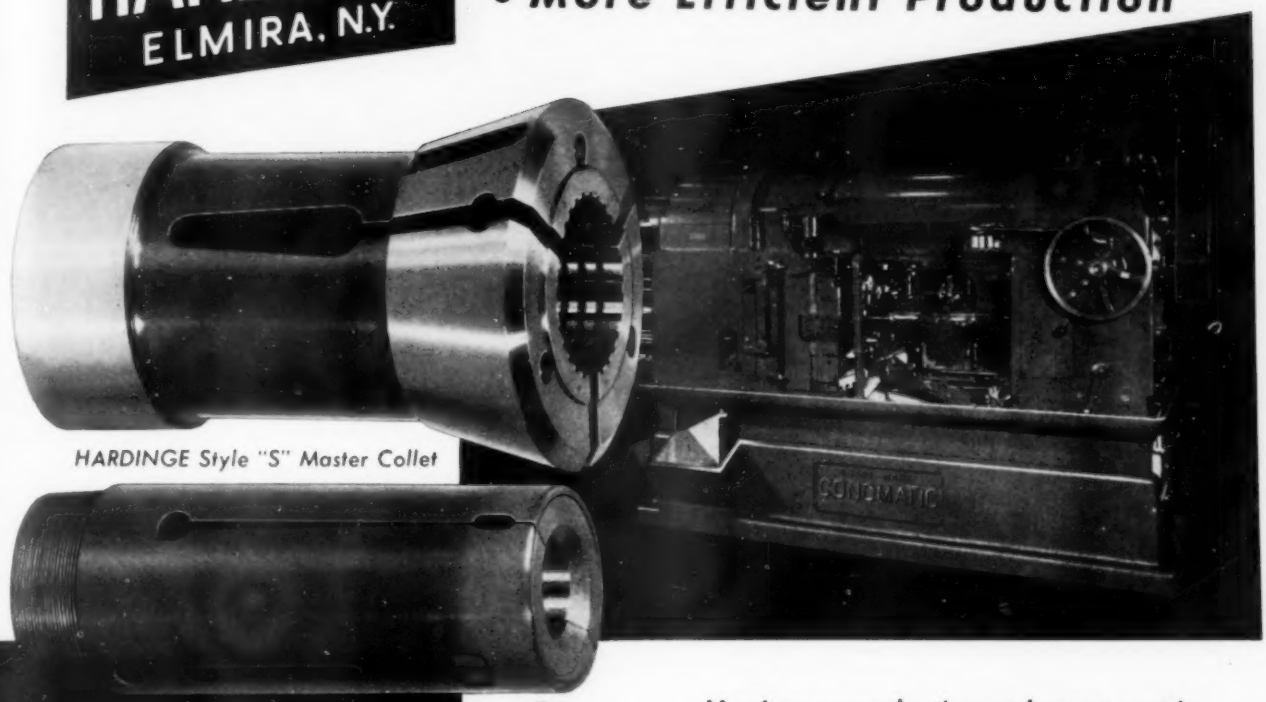
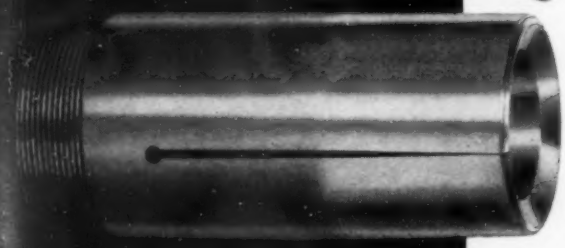
- *More Efficient Production*



HARDINGE Style "S" Master Collet

HARDINGE Style "B" Master Feed Finger

HARDINGE Regular Collet



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Maximum production at lowest cost is assured when you specify HARDINGE Collets and Feed Fingers

Hardinge Master Collets and Master Feed Fingers feature low-cost replaceable pads that are interchangeable among different makes of automatics with the same capacity.

Hardinge Masters give true solid collet and feed finger performance.

Hardinge Regular Collets and Feed Fingers are precision made, hardened and ground internally and externally, and bring you the benefit of 62 years of engineering and manufacturing experience.

* *Also available for the following automatics: Greenlee, Gridley and Acme-Gridley, National Acme, New Britain*

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BALANCED *Action* TAPS

It takes care and skill to make taps that perform with BALANCED ACTION. Only Winter makes them.

It pays you to use BALANCED ACTION taps because of their accuracy—their longer life—and your saving in scrap losses.

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PRECISION CHIP DRIVER CONTOURS

ALWAYS AT YOUR SERVICE

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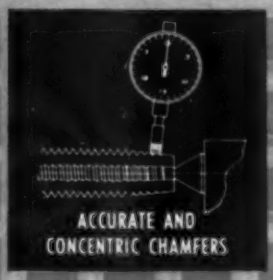

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LANDIS

ROLLING MACHINE

. . . the LAN-HY-ROL, generating external threads by the chipless cold-forming process, offers important improvements in production economy and thread finish. This machine is being built under an exclusive license agreement with Pee-Wee Maschinen und Apparatebau of Berlin, Germany, manufacturers of the world-famed Pee-Wee Thread Roller.

The new LAN-HY-ROL offers the same outstanding combination of precision, productivity, and flexibility which has made the German Pee-Wee Thread Roller unequalled in its field. We will share engineering knowledge and experience with Pee-Wee, and jointly conduct an extensive program of research and development. Significant improvements will be incorporated in the LAN-HY-ROL, comparable to those which have made other LANDIS Equipment outstanding in Thread Cutting, Thread Grinding, and Thread Tapping.

The new LAN-HY-ROL is another forward step in more than 50 years of LANDIS history, during which we have been continuously offering more efficient methods of generating screw threads.

THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT

CUTTING - TAPPING - GRINDING - ROLLING

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES

They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability should replacement ever be required.

After hardening, the metallurgical structure is stabilized by cold treatment at minus 108° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 16 gives the complete story—want one?

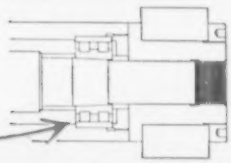
THE AMERICAN TOOL WORKS CO. Cincinnati, Ohio U.S.A.

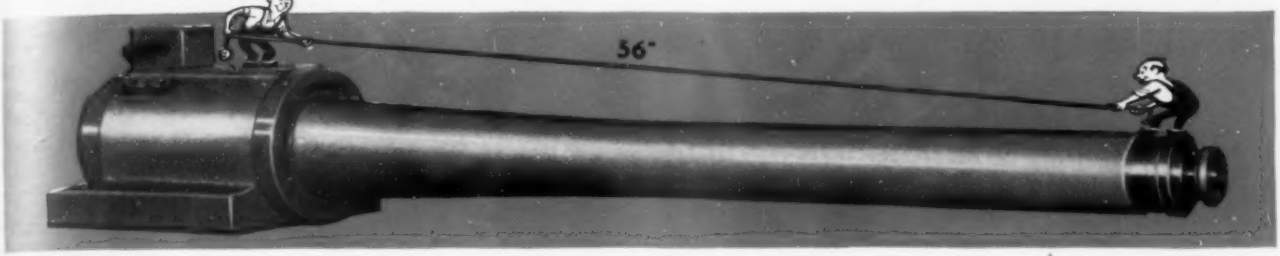
LATHES AND RADIAL DRILLS

YOU CAN *Specify* POPE PRECISION SPINDLES WITH CONFIDENCE

TAKE THESE **DEEP HOLE** SPINDLES, FOR EXAMPLE

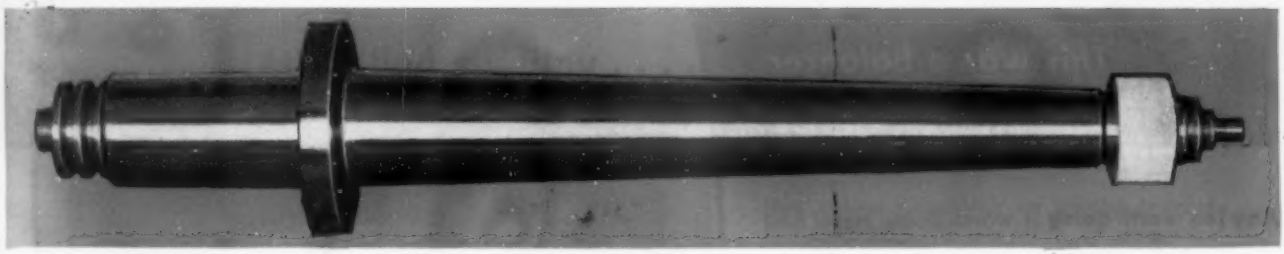
Only POPE Deep Hole Spindles are equipped with tapered bore, double row, cylindrical roller bearings close to the wheel for maximum rigidity.





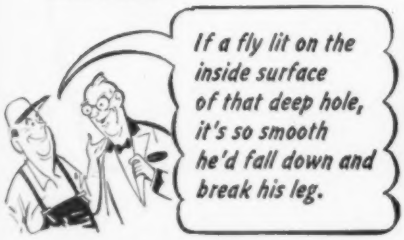
POPE Deep Hole Spindles produce more holes per day because they can take heavy cuts; superior finished holes due to their shaft and bearing construction and Pope precision craftsmanship. Pope Spindles are dynamically balanced with all rotating parts in full assembly to insure smooth running and good grinding results.

▲ Pope P-5886 Motorized Deep Hole Spindle — 75" overall length, 4" barrel diameter at the wheel end, 6" at the motor end

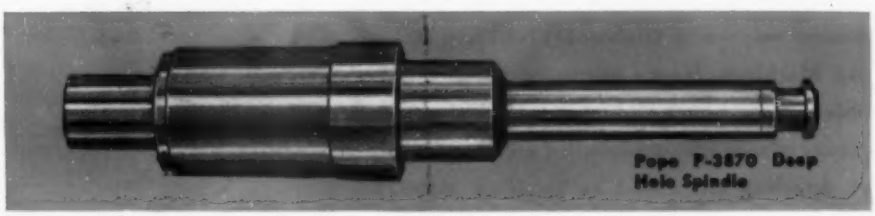


LUBRICATION — Pope System. The bearings are permanently lubricated for their entire operating life and require no further attention.

▲ Pope P-16022 Belt Driven Deep Hole Spindle



— an actual comment made by the operator of a Pope Deep Hole Spindle to a shop inspector.



Pope P-3870 Deep Hole Spindle

Ask for detailed specifications and prices on Pope Heavy Duty Deep Hole Precision Spindles.

No. 98

Specify **POPE®** PRECISION SPINDLES

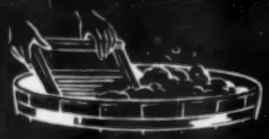
POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

How times have changed!

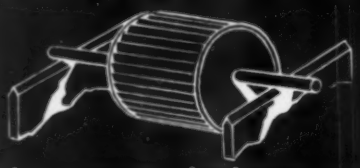
for instance:

This was transportation . . . . **NOW** this is it.

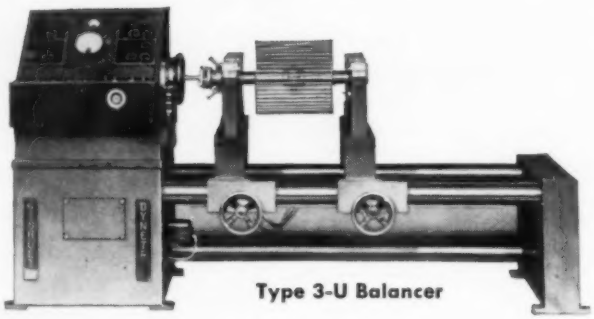
This was the best cleaner . . . . until we got **THIS.**



The old rub-a-dub washdays . . . . gave way to **THIS.**



This was a balancer . . . . . . until we built **THIS!**



Type 3-U Balancer

Any job worth doing is worth doing *right!* And with today's precision manufacture and high-speed rotating parts, that applies to balancing more emphatically than ever.

If your work involves balancing, do it the *modern* way—with Gisholt DYNETRIC Balancing Machines. Here's unrivaled speed that enables you to locate and measure unbalance in a matter of seconds—unequalled accuracy, capable of detecting vibrations as small as .000025".

Gisholt Balancers are available for handling all kinds of rotating parts, from a fraction of an ounce to many tons. Write us for a copy of the booklet STATIC & DYNAMIC BALANCING.

DYNETRIC BALANCERS

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American's KING size selection is made to Order

COMPARE AMERICAN		WITH ANY OTHER BRAND
1 Can you ORDER more stock sizes from smallest to largest?	Yes	
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4 Will your ORDER be precision made for extra long wear?	Yes	
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ONLY AMERICAN CAN ANSWER YES TO ALL THESE QUESTIONS

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More and more companies are ordering American Drill Jig Bushings than ever before. The reasons are these: Simplified, 3-D ordering method, no confusing code numbers; our Distributors are located in every major area throughout the United States and are fully stocked with our King Size selection of A.S.A. and American Standard types of sizes; a superior product is assured because American specializes only in Drill Jig Bushings.

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COST-CUTTING PROGRAMS PAY OFF only when process, production and quality control engineers use up-to-date methods and equipment. How much are out-moded gages handicapping *your* progress?

COSTS CAN BE CUT SEVEN WAYS when modern Federal Gages take over:

1. **Reduction in undersize dimensions and oversize holes** which scrap up to 10% of production.
2. **Less rework on oversize work** which hogs as much as 30% machine time in some plants.
3. **Material costs cut** through purchase of smaller-sized stock, made possible by holding work to closer tolerances.
4. **Inspection time halved** when visual indicating gages replace ordinary micrometers, vernier calipers and fixed gages. Even higher savings result when Federal multi-dimensional and sorting gages are used.
5. **Quality control simplified** by gages that warn machine operators *before* they produce scrap.
6. **Assembly speeded** when visual indicating or automatic sorting catches out-of-tolerance parts formerly overlooked because of human error.
7. **Gaging costs cut** when Federal MODIFIED STOCK GAGES eliminate need for costly special gage engineering.

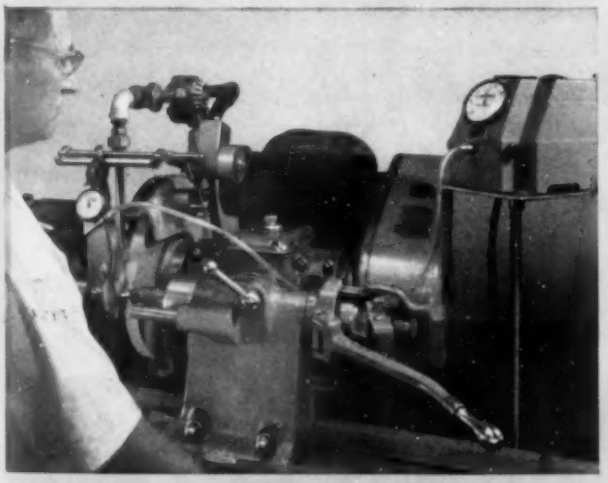
INVESTIGATE! Catalog 52 shows Federal Gages which help cut costs all along the line. Write for your copy today. Federal Products Corporation, 4195 Eddy St., Providence 1, R. I.

DON'T MISS IT! 1954 INDUSTRIAL EXPOSITION
PHILADELPHIA CONVENTION CENTER APRIL 26-30 incl.

Ask FEDERAL

FOR ANYTHING IN MODERN GAGES... **Visit Booths 315 — 321**

DIAL INDICATING, AIR, ELECTRIC OR ELECTRONIC — FOR INSPECTING, MEASURING, SORTING OR MACHINE SIZE CONTROL.



ACCURACY and OUTPUT INCREASED! Here, the new FEDERAL ARNOLDAIR unit is applied to the well known Arnold continuous grinding gage. This makes faster and more positive dial reading. Work is ground to required dimensions more positively, with less human attention.

MULTIPLE MEASUREMENTS AT A GLANCE! This operator is measuring the concentricity of the pitch diameters of two sets of teeth by means of the center Indicators. With the same gage she then checks the concentricity of the hole at each end of the gear in relation to the body O.D.

no one else can do it!

the LAPOINTE Mid-cycle Retilting AUTOMATIC FIXTURE permits the BROACHING of NON-PARALLEL CONTOURS in a single pass

without removing the part from the fixture!

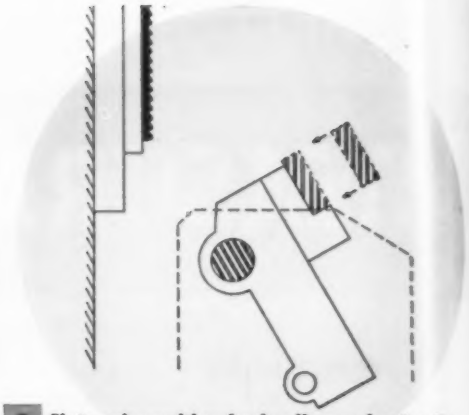
15-TON 90" DRV LAPOINTE BROACHING MACHINE

Necks of stainless steel turbine blades are finished-broached at **2 different angles** on this 15-ton 90-inch stroke Double Ram Vertical LAPOINTE Surface Broaching Machine.

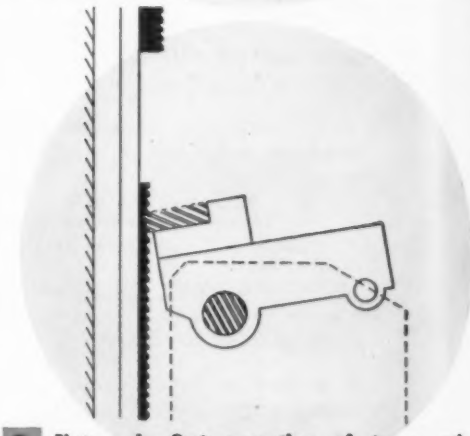
The broach is in two sections with a "dwell" between, thus allowing sufficient time for the fixture to change position for the second cut which occurs **on the same stroke.** Result: removal of .340" stock per surface and a production of 240 parts per hour, at 80% efficiency.

This is another example resulting from more than 50 years of Lapointe engineering . . . entirely in the field of broaching.

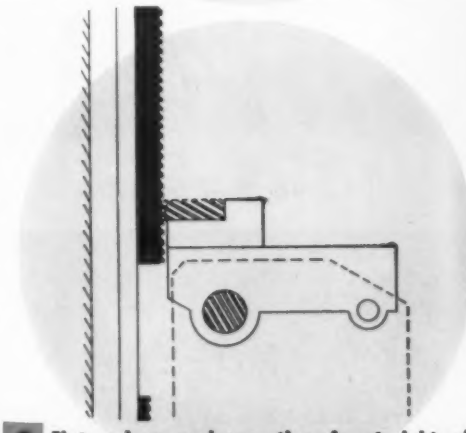
Bulletin available on request. Ask for DRV-5



1. Fixture in position for loading and unloading



2. Fixture in first operation of taper cut



3. Fixture in second operation, for straight cut

This mid-cycle retilting automatic fixture is synchronized with full electrical interlocks.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

YES, THAT'S A TWIST DRILL

A few minutes ago it was a bar of high grade tool steel equal to that used in any drill to be found. Now this steel is being *further* refined and toughened by hammer forging, the process universally used by the makers of high quality tool steels.

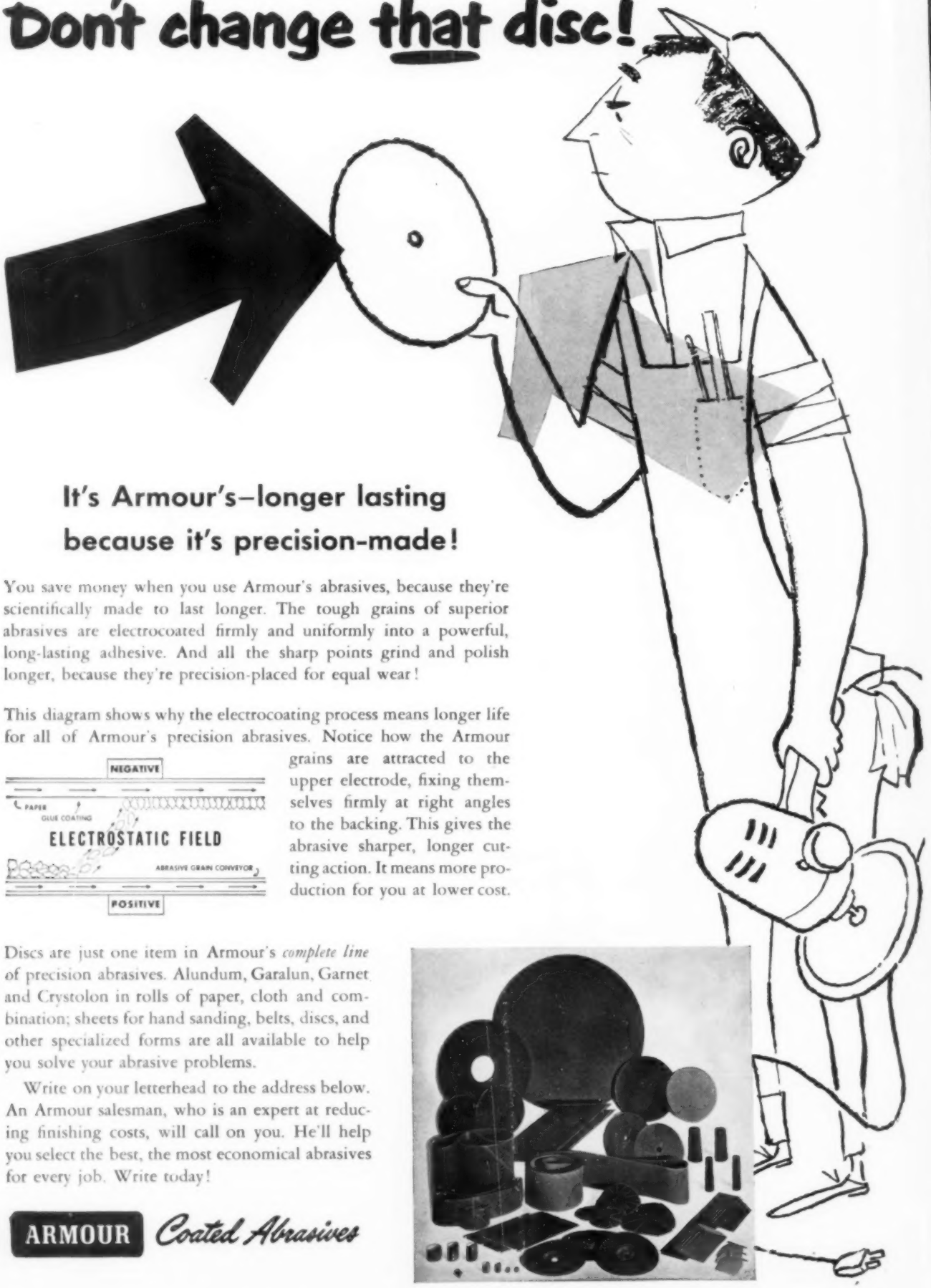
All GTD-AMPCO drills over 1″ are hammer forged before twisting. And the flutes are polished, too.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

Don't change that disc!



It's Armour's—longer lasting because it's precision-made!

You save money when you use Armour's abrasives, because they're scientifically made to last longer. The tough grains of superior abrasives are electrocoated firmly and uniformly into a powerful, long-lasting adhesive. And all the sharp points grind and polish longer, because they're precision-placed for equal wear!

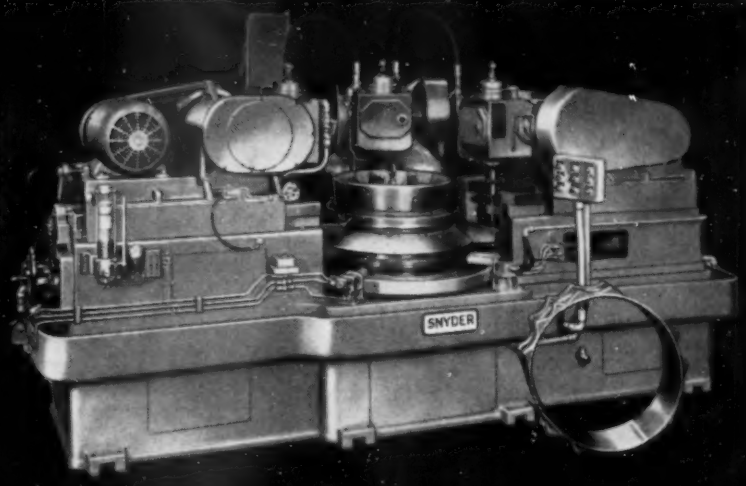
This diagram shows why the electrocoating process means longer life for all of Armour's precision abrasives. Notice how the Armour grains are attracted to the upper electrode, fixing themselves firmly at right angles to the backing. This gives the abrasive sharper, longer cutting action. It means more production for you at lower cost.

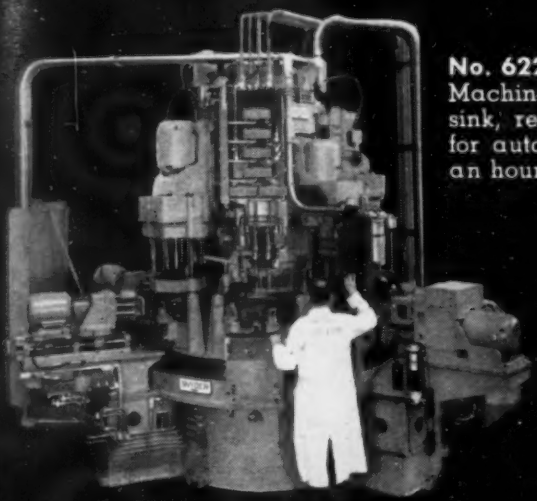
Discs are just one item in Armour's *complete line* of precision abrasives. Alundum, Garalun, Garnet and Crystolon in rolls of paper, cloth and combination; sheets for hand sanding, belts, discs, and other specialized forms are all available to help you solve your abrasive problems.

Write on your letterhead to the address below. An Armour salesman, who is an expert at reducing finishing costs, will call on you. He'll help you select the best, the most economical abrasives for every job. Write today!

ARMOUR *Coated Abrasives*

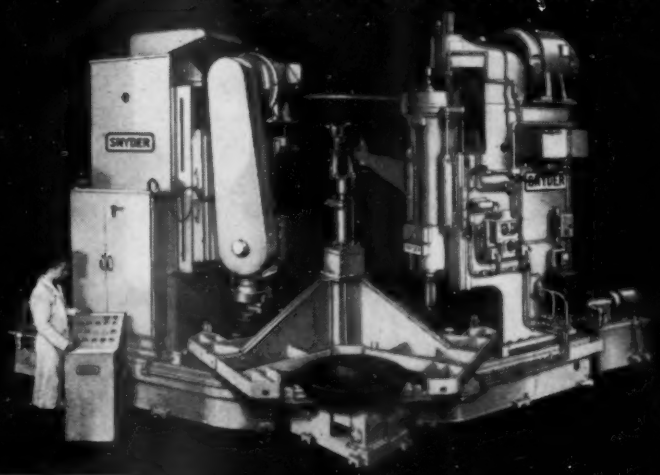
No. 68326—A three-way machine to profile mill four rows of lugs on a compressor casing for jet engines. 135 minutes are used to perform this operation in 3 steps.





No. 62207—Six Station Center Column Machine to drill, counterbore, countersink, ream and tap converter housing for automatic transmissions. 91 pieces an hour at 80% efficiency.

No. 67677—Two-Station, Vertical Column, Boring and Facing Machine to rough bore and face the hub of heavy railroad car wheels. Bore 6¾" x 7" long. 33 units an hour at 100% efficiency.



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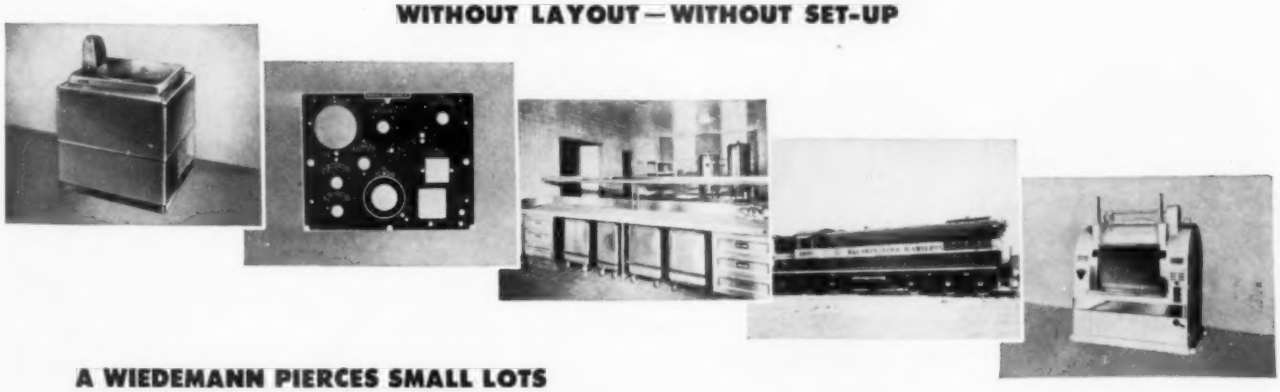

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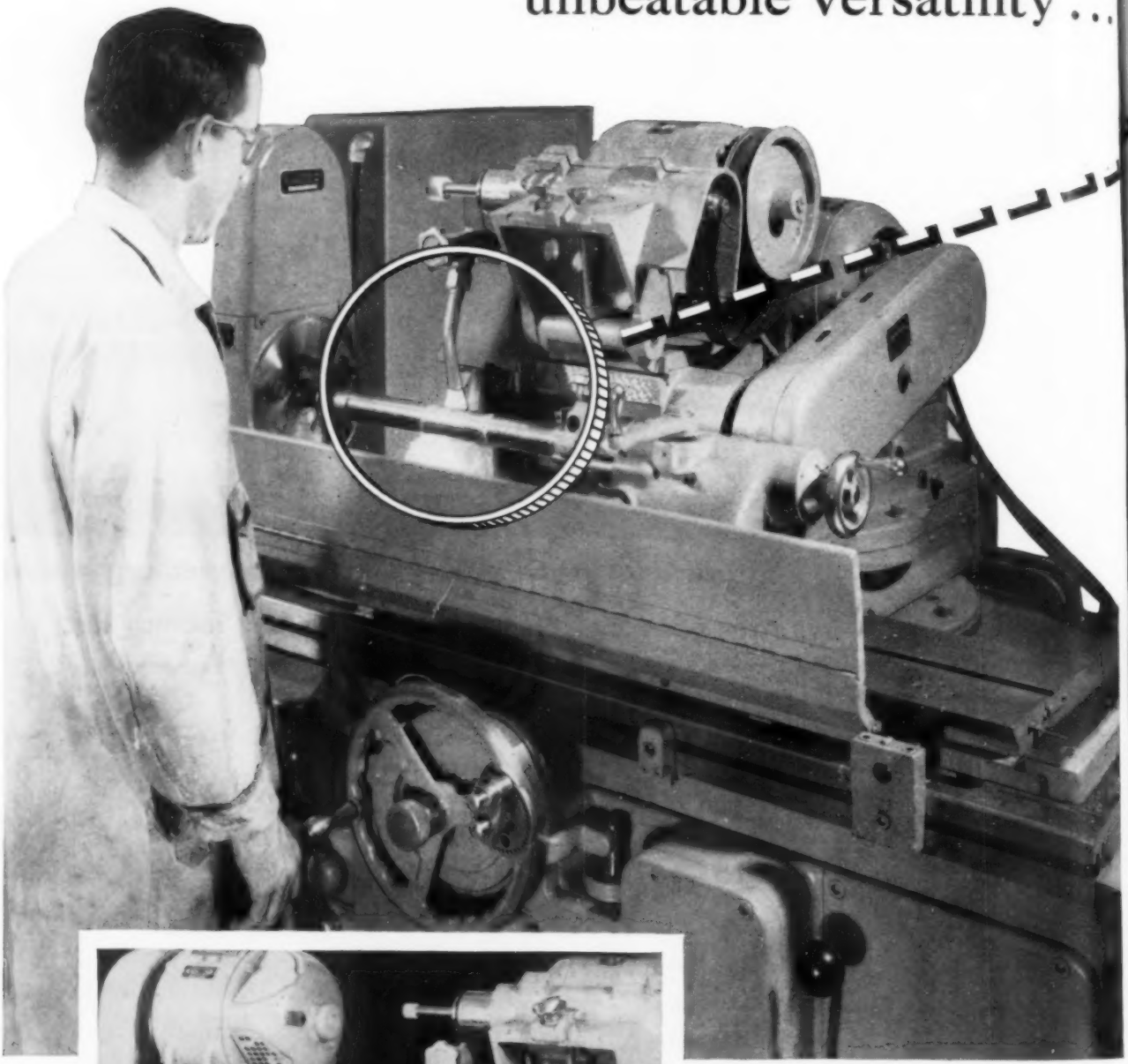

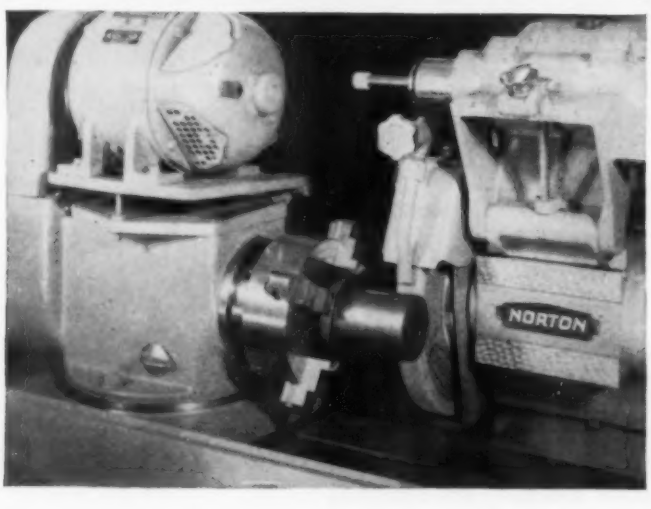

Quick, Easy Set-Ups plus fast grinding action enable this new Norton 12″ grinder to cut time and costs in a wide variety of external, internal, face and angular wheel feed grinding jobs. Here the internal grinding spindle is shown swung up and out of the way while a shaft is being ground.

Permanent Chuck Mounting is an outstanding advantage. Headstock spindle has a dog drive plate on one end. On the other is a 5″ D-1 cam lock nose, on which you can leave a chuck mounted permanently — merely swiveling headstock 180° to start chucking jobs faster.

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Greatly simplified set-ups give you more time for grinding

Double-barreled good news! The new Norton universal grinders are made in 12″ x 36″ and 12″ x 48″ work capacities!

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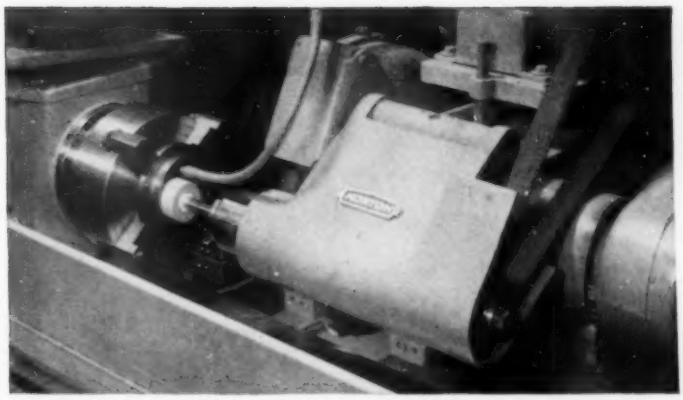
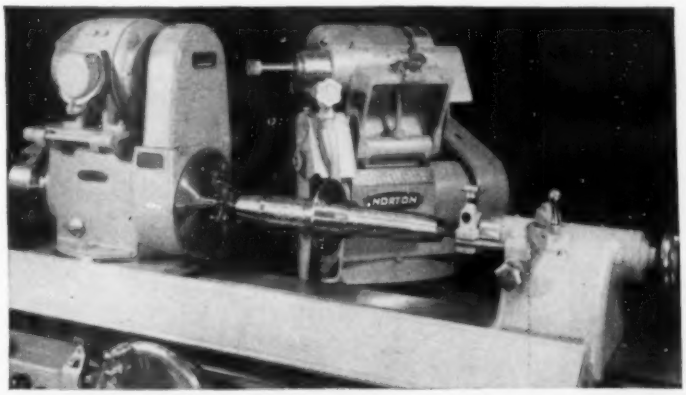
Other important features are illustrated here. It will pay you to look them over carefully — and consider their advantages in your own production.

Get the whole story

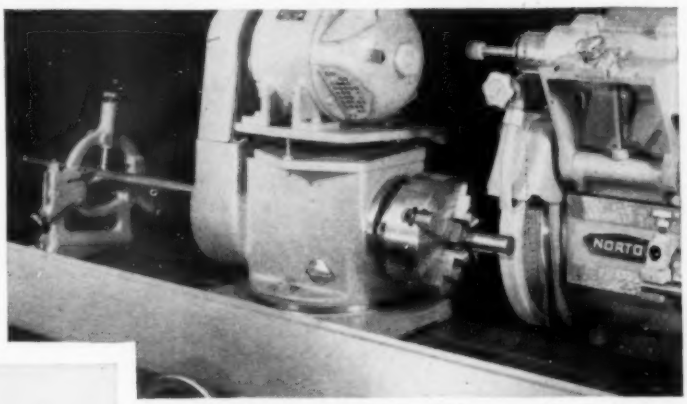
on the broad operational scope and fast, precision performance of these new Norton 12″ grinders. See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



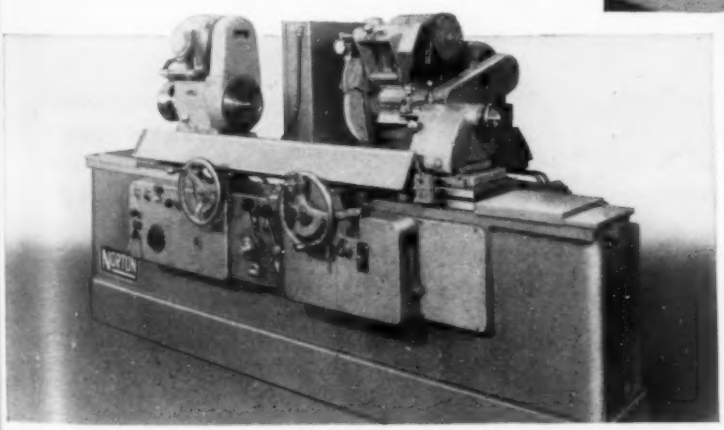
For Quick Change-Over to or from internal grinding, the internal grinding spindle is permanently hinged to front of wheel slide. This also enables you to perform both internal and external grinding on a single workpiece without changing the set-up.



Settings At Any Angle are possible for both wheel and feed, independently, with this compound wheel head slide. Wheel head has swivels above and below the slide ways; upper wheel head member can be positioned to extend capacity when wheel head is swiveled.



Greater Shaft-Grinding Capacity is assured by the hollow spindle in the headstock. A 1¼″ hole clear through the headstock spindle permits passage of shafts that may be longer than the machine — another typical advancement that means greater versatility and usefulness.



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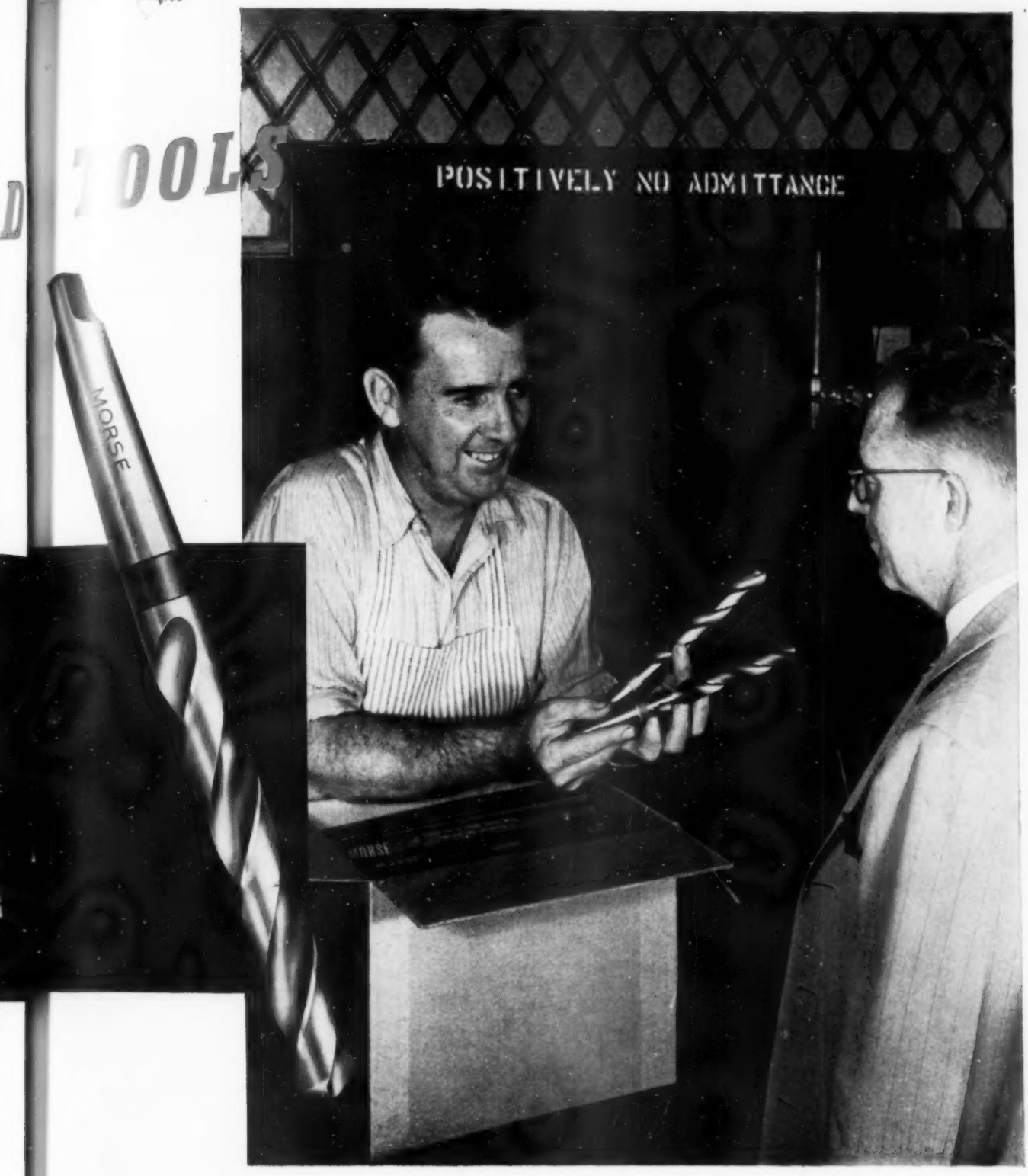

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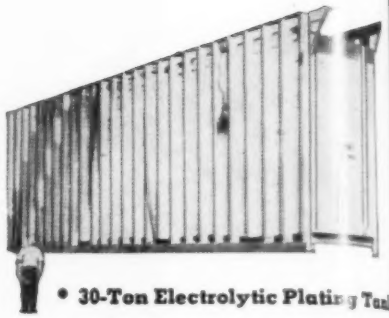

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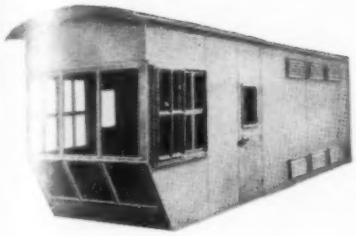

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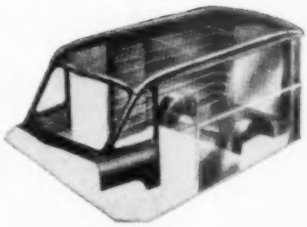

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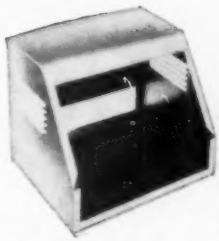

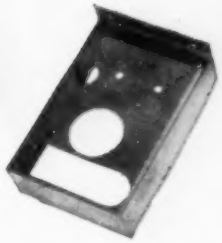

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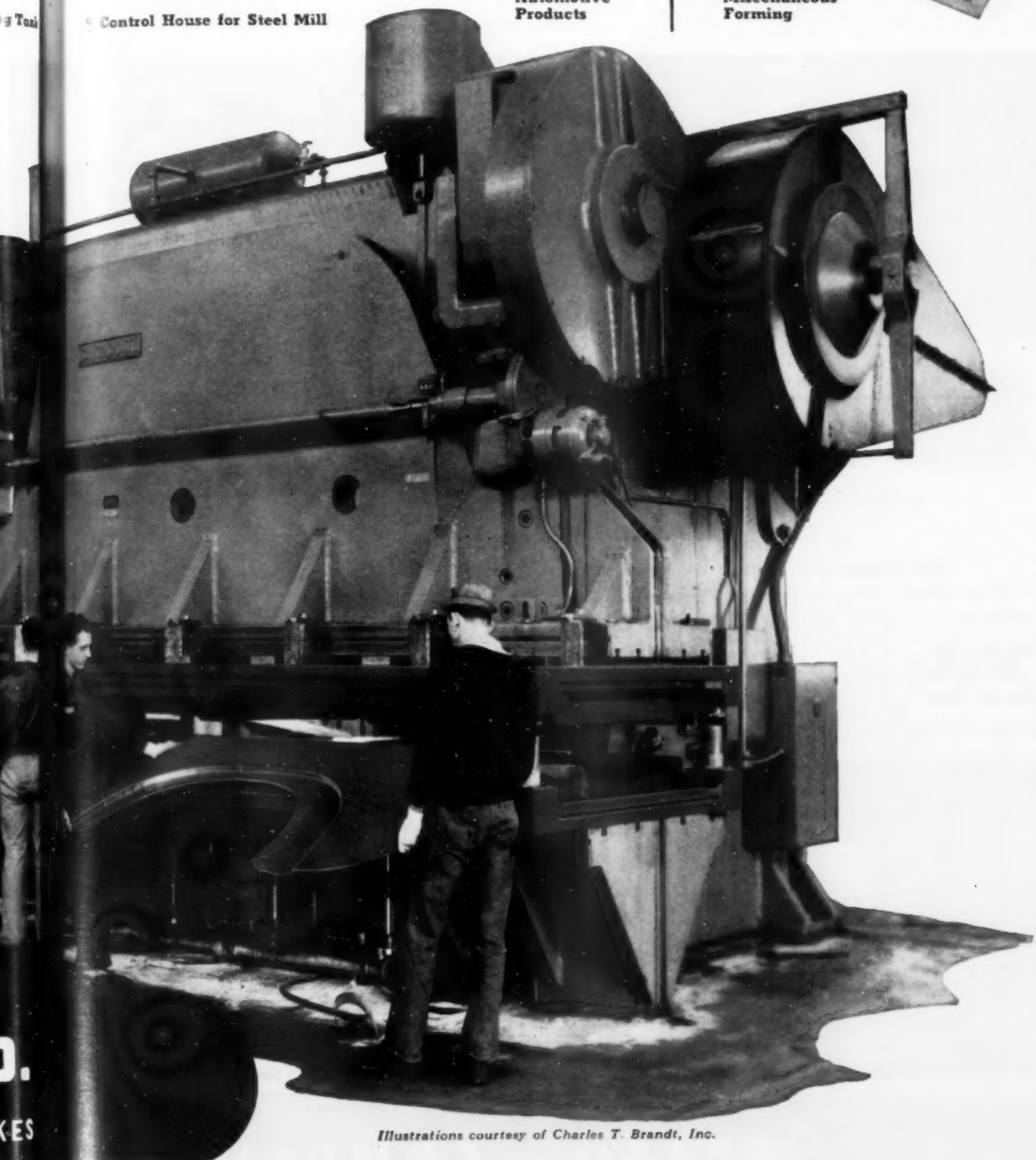
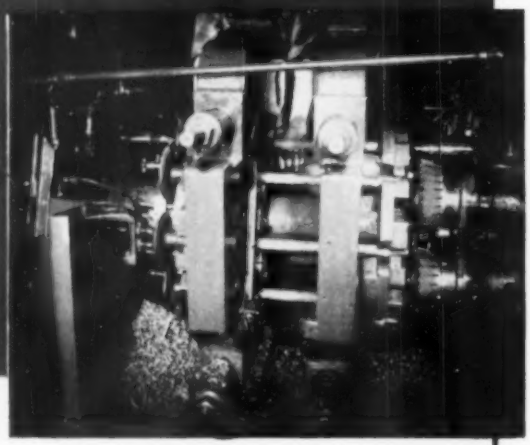


Illustrations courtesy of Charles T. Brandt, Inc.

These jobs prove it!



ACTUAL JOB: Rough and finish mill spline end of rear axle shaft at large automotive plant.

Savings of over $14,225 per year on one machine with one set of Wesson tools

Old Method	New Wesson Method
Cost 1 set inserted blades....$48.00	Cost 1 set Inserted Blades....$
Pieces per Grind.....275	Pieces per Grind.....
Grinding Hours per year. 10,300	Grinding Hours per year.....
5 Machines Running 3 Shifts	3 Machines Running 2 Shifts
Machine Repair per year $25,000	Machine Repair per year...$
Tool Cost per Piece.....$.00545*	Tool Cost per Piece.....$.0

*(Machine repair and grinding costs not included)

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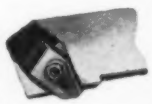
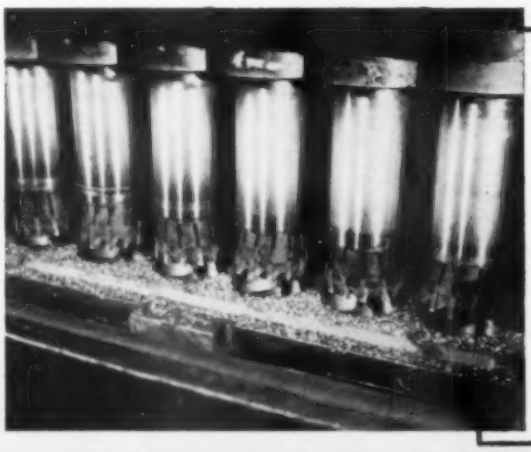
ACTUAL JOB: Using Rockford planer to form cutting edge for a caterpillar bulldozer scraper blade.



On only one machine with one Wesson tool savings of over $5900.00 per year

Old Method	New Wesson Method
Pieces per Grind.....½ to 1	Pieces per Grind.....13½
Total Tool Cost.....$49.25	Total Tool Cost.....$97.16
Average Pieces per tool life.....24 Pieces	Average Pieces per tool life.....324 Pieces
Cost per Piece.....$.60	Cost per Piece.....$.07

HOW IS YOUR PRODUCTION SCORE CARD?



ACTUAL JOB: Rough bore cylinder block on Ingersoll, 6 spindle, boring mill at large farm Implement Mfg. Co.

Over 300% dollar savings per tool

Old Method	New Wesson Method
Pieces per Grind.....836	Pieces per Grind.....
Cost of Tool.....$49.68	Cost of Tool.....$17
Grinding Cost per sharpening.....$11.70	Grinding Cost per Sharpening.....$
Tool Cost per 100 Pieces.....$2.588	Tool Cost per 100 Pieces.....$0.

On *only* one machine with Wesson Tools Savings of over $900 per year

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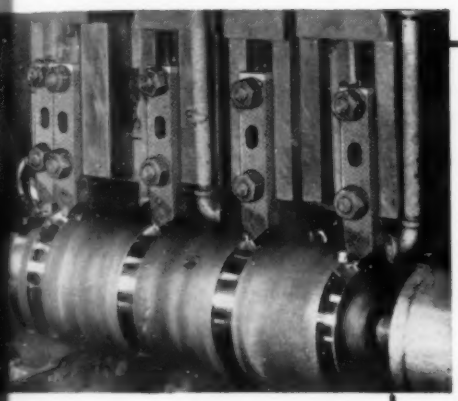
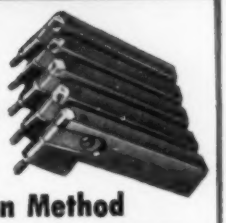


ACTUAL JOB: Rough turn hot forged 155 mm shells at Large Shell Mfg. Plant with Wesson Multicut Parallelogram Band Type Holder.



Another FIRST for WESSON with tool costs reduced by over 60%
Production Increased 400%

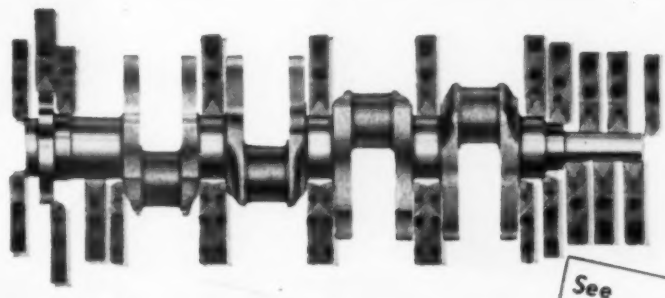
Old Method		New Wesson Method	
Tool Cost	$37.50	Tool Cost	$50.00
Useable Carbide	3/8"	Useable Carbide	9/16"
Average Pieces per Grind	60	Average Pieces per Grind	60
Pieces Machined per Tool	420	Pieces Machined per Tool	1680
Tool Cost per Piece	8.1c	Tool Cost per Piece	2.9c
Down Time for Tool Change	15 min. every hour	Down Time for Tool Change	4 min. every hour

HOW IS YOUR PRODUCTION SCORE CARD?

UAL JOB: Crankshafts being turned for first time ge Automotive Plant with Wessonmetal solid carbide ts in Wesson Multicut Band Type Tool Holders.

Here's Outstanding Performance! An average of 9000 pieces per insert before sharpening

Old Method	New Wesson Method
.....11 per hour	Pieces.....48 per hour
.1 min. 55 seconds	Cycle time....40 seconds
s per tool change verage)....1.7 pieces	Cranks per tool change (average)..1500 pieces



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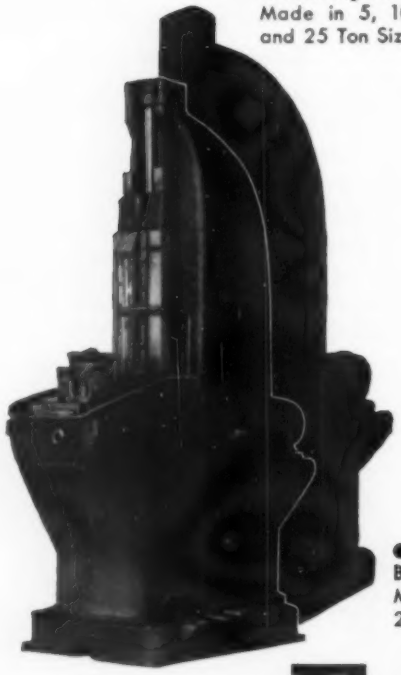

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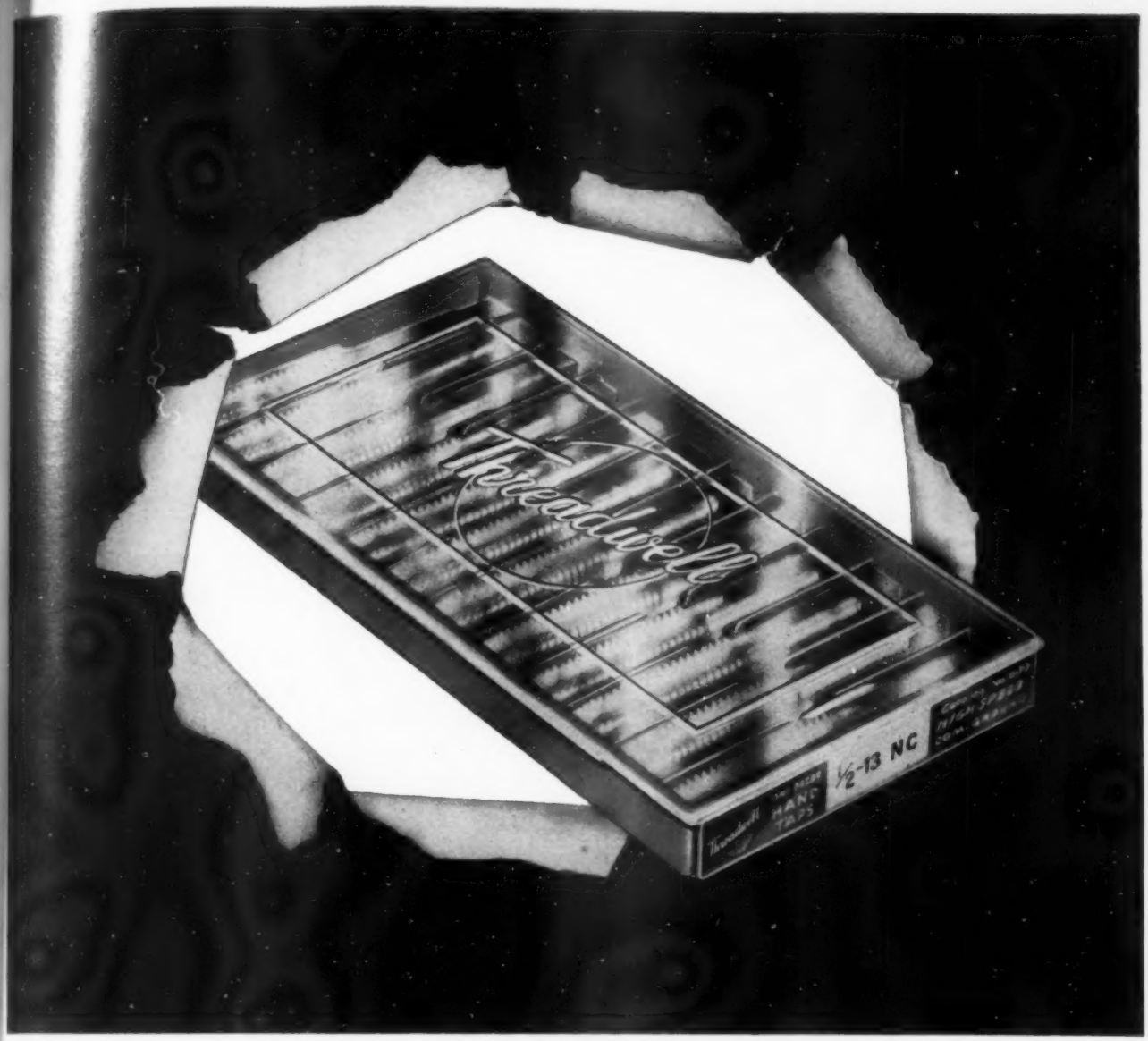

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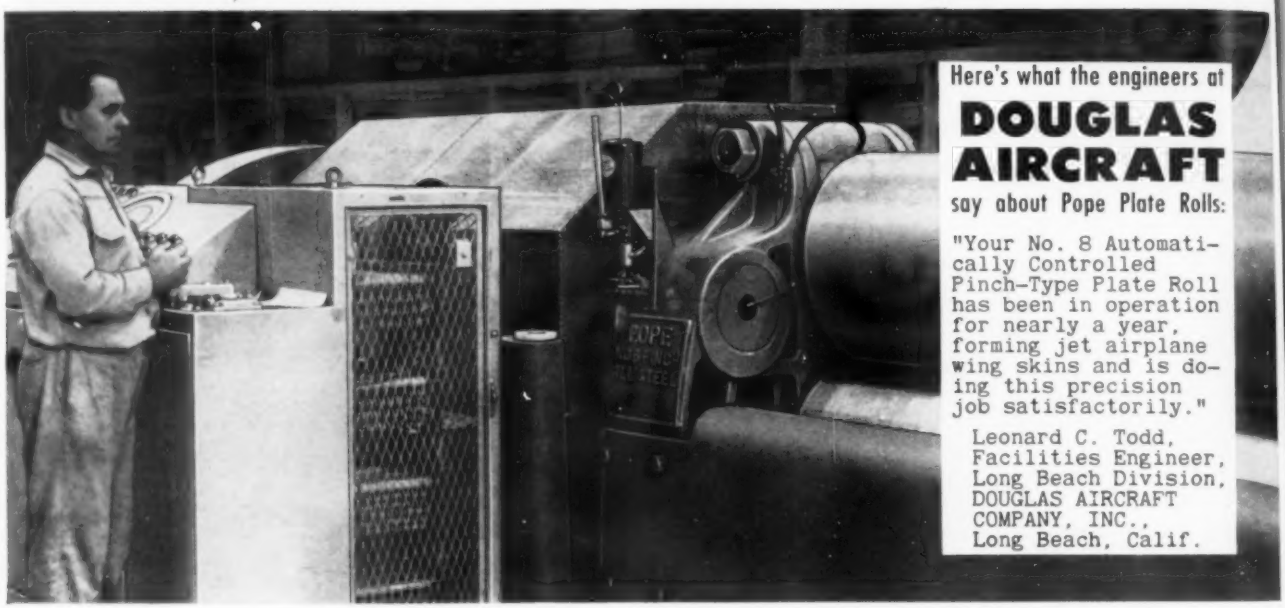

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Leonard C. Todd,
Facilities Engineer,
Long Beach Division,
DOUGLAS AIRCRAFT
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Long Beach, Calif.

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Pope Plate Bending Rolls include both the pyramid and the initial-pinch type, in a wide range of models and sizes. They are used in a great variety of important applications, from "a tin shop to a shipyard". One interesting application is illustrated and described above.

Following are some of the companies using Kling machines:

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Bulletins describing the various types of bending rolls, as well as other Kling machines, will be sent you on request.

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The Tool Engineer

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Looking back on 1953-54 we have witnessed certain gains:

1. Enlarged membership — continuing to uphold our high standard of engineering principles.
2. National Delegate Plan — better Society communication and more Chapter participation in National management.
3. Research Fund — firm ground under this capable committee.
4. General consolidation — our Society is healthy and vigorous, getting bigger and more influential every year.

In completing my term of office, let me emphasize that ASTE is organized to help its members become better engineers. Our constitution preamble charts our path:

> ". . . To be an organized and functioning institution for the advancement of scientific knowledge in the field of tool engineering and the means and methods of applying such knowledge in practice and education in such knowledge and practice; and within said field and to such end, and none other, to promote and through its members engage in research, writing, publishing and dissemination of such knowledge, . . ."

This is your Society — be active in its affairs — cooperate with the newly elected officers, Chapter and National, who give so much of their time that ASTE will not falter as it pushes ever forward in promoting knowledge of efficient manufacturing.

R. F. Waindle

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Fig. 1. Transfer type machine that drills, taps and performs many other machining operations on the hull of a personnel carrier.

production tapping

... how to prevent tap breakage

By Harry Conn*

Chief Engineer
Scully-Jones and Co.
Chicago, Ill.

PRODUCTION TAPPING naturally has many things in common with ordinary short-run tapping. There are, however, many differences in the design of machines and tooling required for sound and economical production tapping.

Taps are frequently broken in short-run work. In fact, about 90 percent of all taps are broken. If automation types of production machines experienced as much trouble in tapping as short-run tapping usually encounters, it is safe to venture that the investment never would be amortized. One of the main purposes of this article will be to enumerate the differences in the techniques of ordinary machine tapping and production tapping such as performed in the transfer machine illustrated in *Fig.* 1.

In production tapping, more thought and preventive measures are exercised to eliminate the packing of chips at the bottom of a hole which can cause tap breakage. Stations are included to turn the work 360 or 180 degrees to remove the chips. This must be done automatically and within the cycle time of the machine. It has been found advisable to drill to an increased depth with some machines that are designed so as to make impossible the revolving of the part. Naturally, it is advisable to have all holes drilled through when the design of the piece part will permit.

In production tapping the percentage of thread, the depth of thread and the size and pitch are usually more compatible with good manufacturing practice. This is because more thought is expended by method and design groups on high production commodities than can be justified in the manufacture of items in small quantities.

Some automotive firms are eliminating all tapped holes under 5/16 inch wherever possible. There usually is no difference in the cost of drilling and

*Senior member ASTE Chicago chapter.

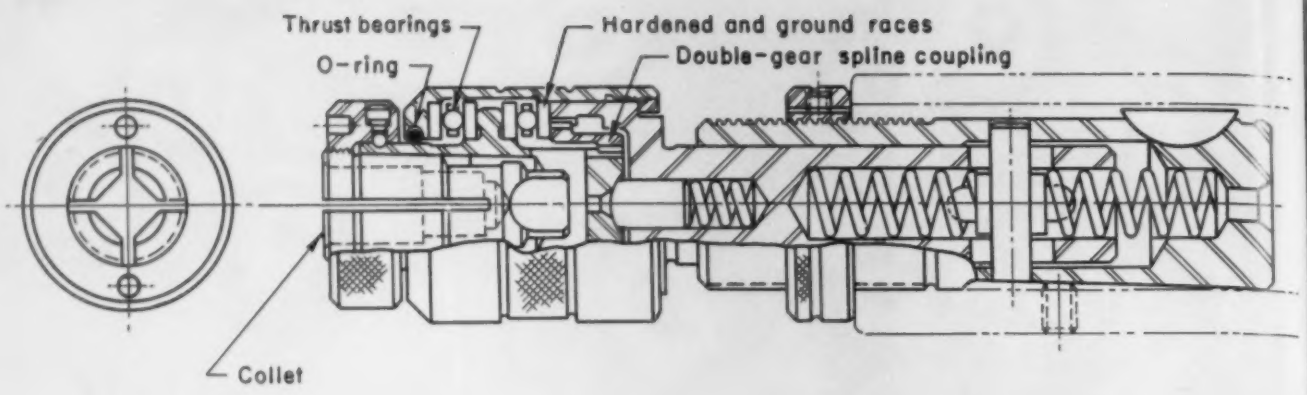


Fig. 2. Tension and compression floating tap holder.

tapping 10-24 holes and $\frac{3}{8}$″-16 holes beyond the fact that one is difficult to tap and the other is easy. The cost difference may be in tool breakage and part salvage for the smaller tap.

When planning a tapping station and specifying the tooling for a transfer type of machine much thought is given to the size of the tapped hole in relation to its depth. Up to $\frac{1}{2}$″-13 tapped holes, there is a safe depth to which a given size of a tap with standard flute length can be safely used in a given material. In short-run tapping, this fact is usually discovered after many taps have been broken and a few parts scrapped.

Counteracting Misalignment

In stort-run tapping, it is usual for a radial-drill or turret-lathe operator to tap 10-24 and 1″-8 threads with the same machine. A machine spindle sensitive enough to tap a 10-24 thread, lacks the power to tap a 1″-8 thread, if it has the power and rigidity to tap 1″-8 thread, it does not have inherent sensitiveness to tap 10-24 threads. Later in this article tools will be discussed which will eliminate this difficulty. In production tapping the spindle is usually designed for a certain size or range of taps.

In ordinary tapping the problem of having no hole for the tap to tap does not exist but it is a definite problem in production tapping. In *Fig.* 2 is shown an answer to this problem wherein the tool holder has a compression feature in its shank that telescopes the spindle should there be no hole to tap.

In production tapping misalignment is one of the major difficulties. This can be caused by a series of accumulations due to tap-shank tolerances, jig borer or boring mill limitation, index error in moving from station to station, expansion of drill head, tapping head or of the piece part, and spindle run-out. In short-run tapping, misalignment is a problem but is not as serious. To eliminate this difficulty in some single-spindle tapping machines, sometimes the piece part is allowed to float.

If the part is heavy and a multiple-spindle tapping machine is used, it is advisable to use floating holders for the taps. For a floating holder to be efficient it should have only a parallel float and the floating members should be divorced from the driving member. A ball cannot drive and float at the same time. A brinelling action will soon result, restricting the float. Should the alignment between the tap and the hole be corrected, the required torque will be reduced approximately 25 percent even though there has been only a minor misalignment.

In multiple-spindle tapping, it is imperative that each spindle be equipped with a leadscrew. This is not imperative, however, in short-run tapping of the lower classes of fits where only one spindle is utilized. In multiple-spindle tapping, the leadscrew insures the correct feed, lead and starting pressure.

In production tapping of holes larger than one inch, keeping the tap in the holder at the correct depth and eliminating the possibility of the tap staying in the work become problems. In *Fig.* 3 is shown a tap holder with a drawbolt that extends through the center of the holder and is screwed into the tapped hole in the shank of this large tap. Naturally, in short-run tapping where the operator can observe the tap this is not needed.

Referring to *Fig.* 2, this tension and compression floating holder will correct misalignment in a vertical or a horizontal plane. It will also compensate for the difference of the lead of tap and the leadscrew. It cushions the shock of stopping and reversing and provides adjustment of tap for depth. The float is provided by the double gear-spline coupling which has clearance between the pitch diameters.

The gear teeth have been rounded on the OD and, with pitch diameter clearance, this allows a parallel floating action. The end thrust is provided for by

Table 1—Approximate Torque Ratings (for 4-flute plug taps)

Tap Size	Torque† (in-lb) Safe	Permissible	Break
1/4-20*	85	120	170
5/16-18	185	250	350
3/8-16*	285	400	570
7/16-14	370	500	735
1/2-13*	450	630	900
5/8-11	650	900	1300
3/4-10	950	1400	2000
7/8- 9	1300	1800	2600
1- 8	1600	2250	3200

*Ratings are based on tests by Iowa State College. Other ratings are based on a comparative analysis of tests.

†Safe torque is based on a 2 to 1 safety factor, permissable rating is based on 70 per cent of break torque.

For tap sizes from 7/16 inch up the required torque for tapping is generally less than the recommended safe torque.

two rows of standard thrust bearings. The floating and driving members are independent of each other, thereby providing full parallel float and avoiding blind spots or angles of non-float. Four hardened and ground races eliminate a possibility of brinelling and restriction of float.

Chips and other foreign matter are excluded from the holder by an O-ring which does not restrict the float. The square in the bottom of the collet insures a positive drive and the collet action compensates for the tap shank tolerance. The collet is assured a positive drive because its tang is driven by a slot. The phantom lines represent the tapping spindle.

Torque Release

Until recently, it has been impossible in multiple-spindle tapping to incorporate a torque releasing mechanism that would be small enough in diameter to be used in close center tapping. The torque releasing mechanism was needed so as to be able to bottom a tap without danger of the torque building up and breaking the tap. In planning for the tapping stations, it is wise to determine the tapping torque required for the depth and size of hole in the material being tapped. This should be done before the machine is built because it may be impossible to make the necessary corrections during the try-out period.

In *Fig.* 4 is a chart that is purely qualitative. It shows how the tapping torque is affected by the depth of a tapped hole, style of tap, chips packing in the bottom of the hole, tapped length or length of flutes in the hole. Studies such as these determine the style of tap, breaking torque, releasing torque, depth of tapped hole that is feasible and other factors pertinent to efficient tapping. Typical tap torque capacities are listed in TABLE 1.

In *Fig.* 5 is shown a Safe-Torque tap driver which was used on a part and has tapped 400,000 holes. Only two taps were broken and the reason has not been determined. Previously, 200 holes per tap were obtained. This type of driver is also being used on

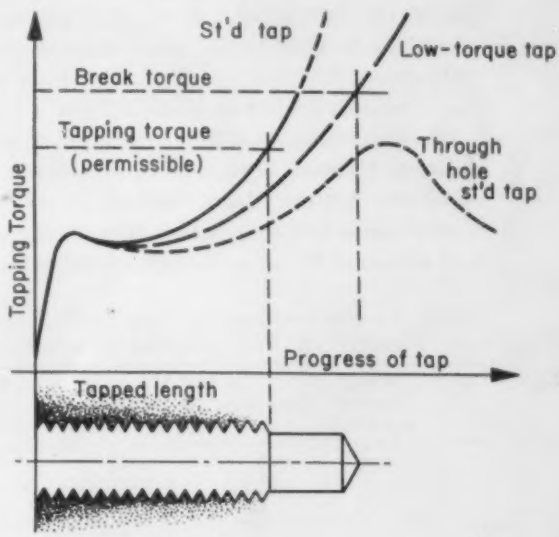
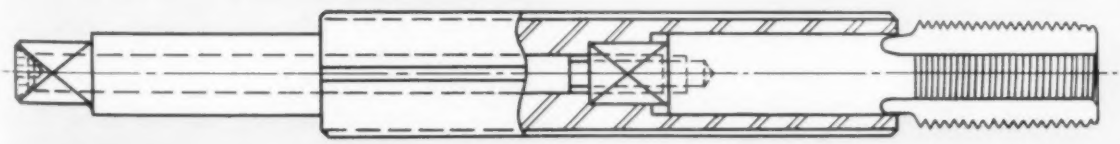


Fig. 4. Comparative torque curves for standard, low-torque and through hole taps.

Fig. 3. (below) Tap holder corrects misalignment in vertical or horizontal plane.



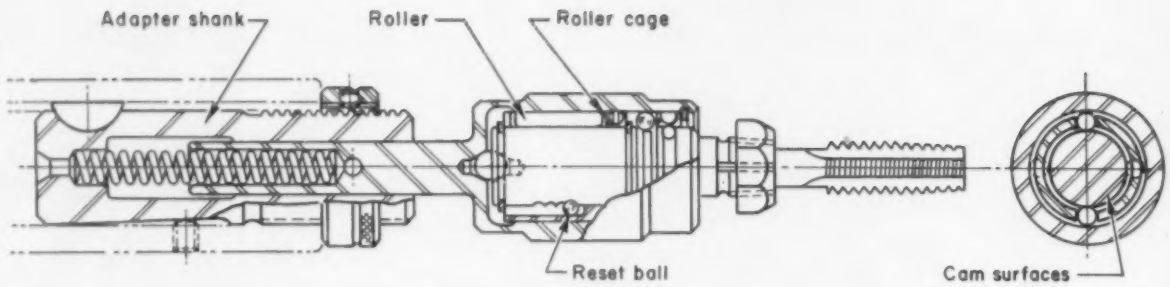


Fig. 5. Tap driver has overload torque release to prevent tap breakage.

a multiple-spindle tapper that is tapping 56 holes at one time and has not yet broken a tap.

This driver is so designed that it will release when the driving torque on the tap exceeds a predetermined safe-torque setting. If there is no hole to tap (due to broken drill) the unit will telescope. Should the drilled hole be too shallow, this tool will telescope after hitting the bottom of the hole and release. This holder will also release when the torque exceeds the setting of the holder.

Power is transmitted from the tapping spindle, shown in phantom lines, by a Woodruff key to the adjustable adapter shank. Power is transmitted from the body to the tap holder by two rollers. Overload release of the tap is brought about by the force of cammed surfaces acting against the rollers. This expands the shell-like outer body thereby releasing the drive.

This body is computed and designed to expand at 70 percent of the breaking strength of the tap, thereby disconnecting the tapping spindle torque from the tap. On high production, close center distance conditions, these holders have no torque adjustment. When the center distances of the spindles permit, an adjusting collar can be incorporated. The adjustment is then obtained by screwing this collar to change its lateral position. The outside diameter of the body has a slight taper which corresponds to the internal taper of the adjustable collar. The torque adjustment is determinned by the amount of clearance between the OD of the body and the ID of the collar, because the collar either allows expansion of the shell-like body or restricts it in accordance with the adjustment.

When the holder releases and the spindle reverses, the rollers are reset by two balls and the rollers are again used by the outer body to drive the cam drive collet in reverse to remove the tap from the hole. The centrifugal motion of the body when reversed will then reset the rollers to a driving position. The rollers are held in opposite position by a cage, and the cage and balls are for direction and position. The cam path for the balls is not shown.

The concentricity between the cam drive collet and the body is maintained by balls. There is no lateral movement between the body and the cam drive collet.

An attempt has been made to show how sensitiveness, power, depth error compensations, leadscrew and tap lead differences can be reconciled and the correct torque capacity can be incorporated into a machine. Naturally, this can only be done after various factors have been considered and analyzed such as material, depth, pitch, class of fit, percentage of thread, style of tap, speed, size, chips and tap life.

Table 2—Recommended Tap Drill Sizes and Percent of Full Thread Produced

Thread Diameter and Pitch	Tap Drill Size Designation	Diameter (inch)	Percent of Full Thread
4-40	42	0.0935	57
48	41	0.0960	59
5-40	37	0.1040	65
44	36	0.1065	63
6-32	34	0.1110	67
40	32	0.1160	68
8-32	29	0.1360	69
36	28	0.1405	65
10-24	23	0.1540	67
32	20	0.1610	71
12-24	15	0.1800	67
28	3/16	0.1875	61
1/4-20	5	0.2055	68
28	7/32	0.2187	67
5/16-18	17/64	0.2656	65
24	J	0.2770	66
3/8-16	P	0.3230	64
24	R	0.3390	67
7/16-14	V	0.3770	65
20	X	0.3970	62
1/2-13	7/16	0.4375	63
20	29/64	0.4531	72
9/16-12	1/2	0.5000	58
18	33/64	0.5156	65
5/8-11	35/64	0.5469	66
18	37/64	0.5781	65
3/4-10	21/32	0.6562	72
16	45/64	0.7031	58
7/8-9	25/32	0.7812	65
14	13/16	0.8125	67
1-8	57/64	0.8906	67
12	59/64	0.9219	72

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

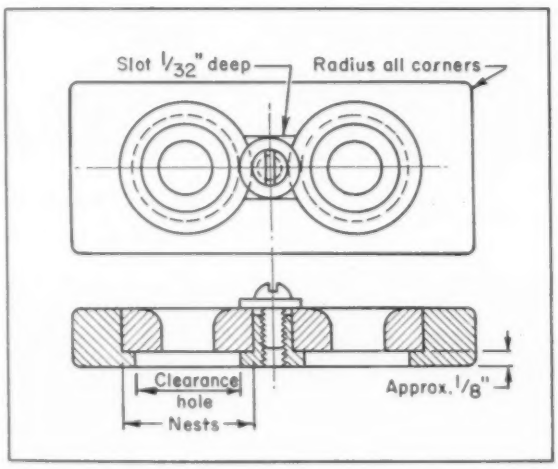
Replaceable OD Gages

Go and Not Go gages of the type illustrated, are inexpensively and quickly made to accurate sizes in any toolroom. By allowing adequate clearance hole diameters in the plate, the gages can be utilized for numerous jobs by installing proper size inserts.

Gage cost and storage space is held to a minimum, since either or both are easily removed for repairs or replacement of a different size. Lacquer of contrasting colors may be applied for quick identification.

The insert nests can be bored to fit suitable and available tungsten carbide nibs. In this way, many die, sizing ring or wire guide nibs normally scrapped, can be salvaged to provide satisfactory carbide gages.

The holder plate is made of machine steel. The center slot 1/32-inch depth assures adequate washer pressure to hold the inserts firmly in place. A



buttonhead screw and flat washer are suggested. The ends of the plate should be clearly stamped for identity of Go and Not Go gages as illustrated. All dimensions will be governed by selected insert size and maximum work diameter. An easy fit can be alloted the inserts so that accurate plate boring is unnecessary.

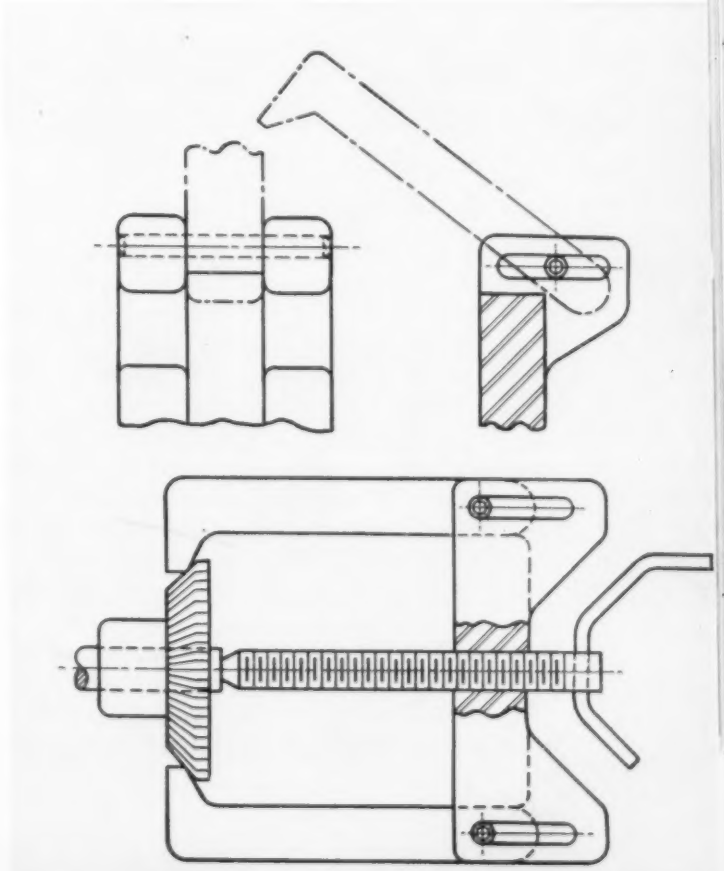
William V. Anderson
New Haven Chapter

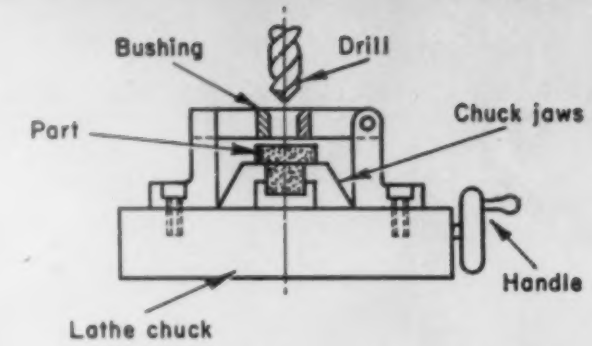
Bevel Gear Extractor

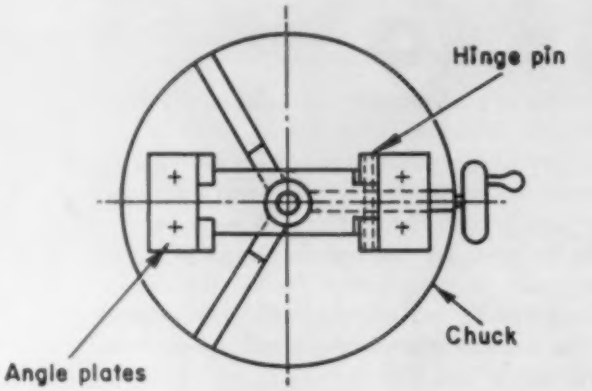
Removing a stubborn bevel gear or part of similar contour often presents a difficult problem because of jaw slippage that occurs with most types of extractors. To overcome this, in a particularly obstinate case, a yoke-like device was contrived to straddle the jaws, but this took up too much space. Further study of the problem yielded the design illustrated, which works satisfactorily. In its favor also is the fact that it can be made with a minimum of machining.

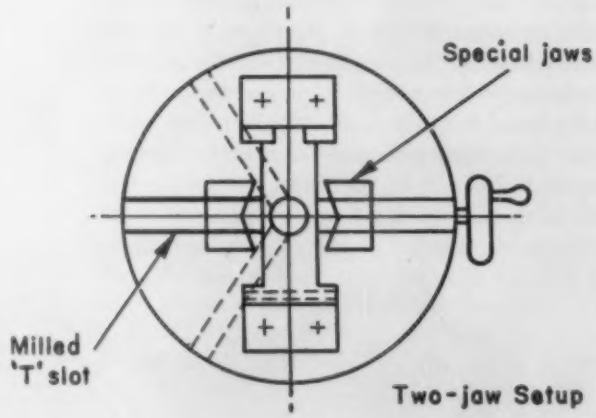
Operation is simple. First the jaws are loosely engaged over the part. The handle is then tightened while the extractor is held in place. As tightening increases taking up the play in the slots by forcing the jaw hinges to the end, the jaws are locked in a parallel plane. Slippage and deflection are thus overcome permitting sufficient force to be exerted on the gear to free it from the shaft. The device can be made in the size or sizes most commonly needed.

Robert Buckley
Hartford Chapter









Self-Centering Drill Jig

Discarded universal lathe chucks can be converted easily into self-centering drill jigs by mounting hinge plates on them as shown in the accompanying sketch. First it is necessary to remove any projections from the rear of the chuck to secure a flat surface. The angle plates are mounted on the chuck as shown so as to avoid interference with the chuck jaws. Convenience and speed of operation are improved by welding a handle to the tightening screw gear. This eliminates picking up and inserting the chuck wrench each time a part is clamped or removed.

Use of a center drill with this device is unnecessary. The part is held sufficiently rigid for other operations such as counterboring, spotfacing and tapping. The universal jig accommodates a range of sizes of workpieces. Also, various sizes of drill bushings can be inserted in a liner in the hinge plate.

This type of drill jig is especially useful for centering castings which may be slightly out of round. The large hole in the center of the chuck is advantageous when large taps, which must go through the center, are used.

The chuck can also be converted into a two-jaw, self-aligning universal drill jig by milling a T-slot opposite one of the original slots, as shown in the lower sketch. The unused jaws should be removed and their slots covered. The added jaw may be trued in a lathe. Blank jaws may be used with inserts to fit jobs to be performed.

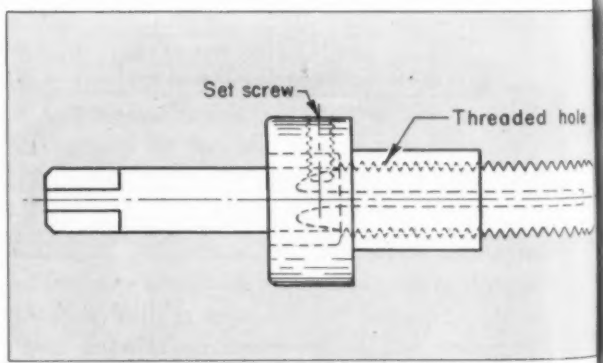
George J. Whitley,
Philadelphia Chapter

Tap Guide Bushing

In a production run on an air tool, it was necessary to tap a hole concentric with a tapered hole.

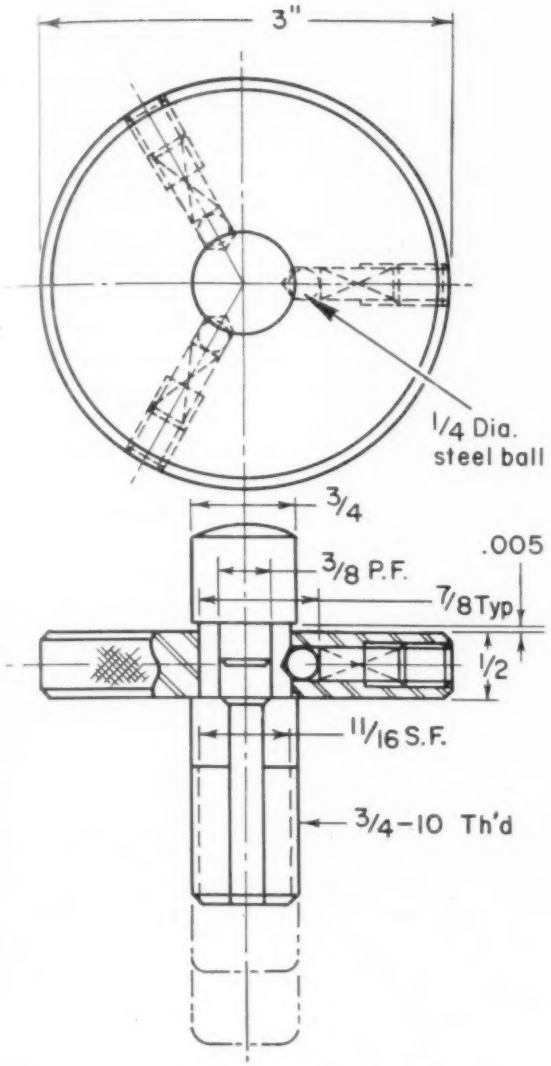
The hole was drilled and taper-reamed in the same operation through bushings and liner. Since the OD of the tap was larger than the shank, and the OD usually was not consistent, it was inadvisable to guide on it. To make a satisfactory guide bushing a hole was drilled and tapped in a piece of heat-treated 4140 steel stock using the production tap. The tap was left in the stock and locked in place by a dog point setscrew tightened into a flute of the top to prevent the bushing from turning. The entire assembly was then turned between centers. With this device a concentric hole was insured by guiding on the liner.

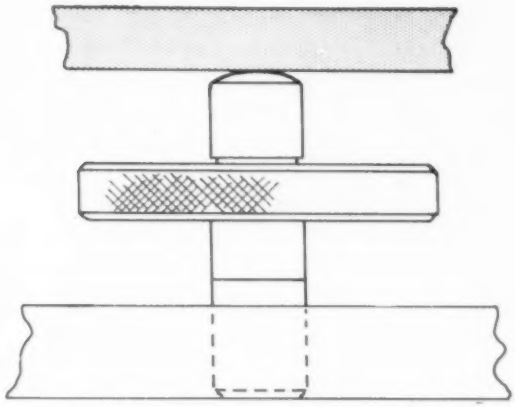
This method is also advantageous in a setup when it is desirable to guide on the OD of the tap and



when there is insufficient room between the tap and the liner for a regular bushing.

George Bo-Linn and Joseph Hubacek
Houston Chapter





Torque Screw Jack

This device has been found especially advantageous for use with milling fixtures where support without distortion is required.

The torque screw jack is readily made from the accompanying drawing. Either or both of the legs can be made to whatever length is needed. The outer rim of the adjustment wheel should be knurled and it is suggested that all parts be given cyanide finish.

The jack can be used in a variety of ways, as exemplified in the accompanying sketch. It can be adjusted for torque by means of the set screw or by replacing the springs. A lock screw could be used if preferred to hold the set screw in place.

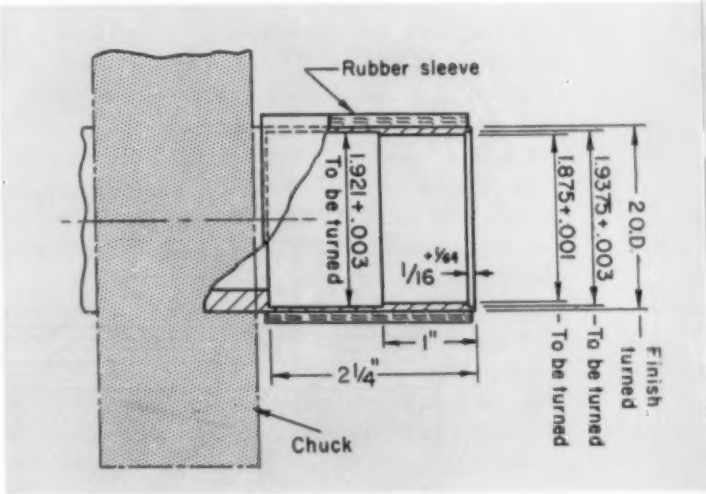
William Borowski
Chicago, Ill.

Rubber Sleeve for Thin Wall Turning

When a finishing cut is being made on the inside of a thin tube, difficulty in working to close tolerences is often encountered due to spring or vibration caused by tool pressure. This effect may be greatly reduced by using a rubber sleeve as illustrated.

This is done in the following manner: The outside diameter of the workpiece is finish turned. The part is chucked on the OD just completed. The inside diameters are rough turned, leaving an allowance of a few thousandths of stock for the finish cuts. A 1/8-inch thick piece of rubber is stretched or wrapped around the outside of that portion of the workpiece to be finished. The final cuts are then made.

With this method it has been found that there is a minimum of vibration and runout. Finish cuts on ID can be held to fairly close tolerances such as those shown on the accompanying sketch.



John P. Clark
Twin States Chapter

Universal Router Jig

This jig can be used as temporary tooling for early production of aircraft parts on the pin router pending completion of permanent tooling. So used it has filled an urgent need, eliminating hand work and speeding parts manufacture for prototypes, preliminary models or other emergencies.

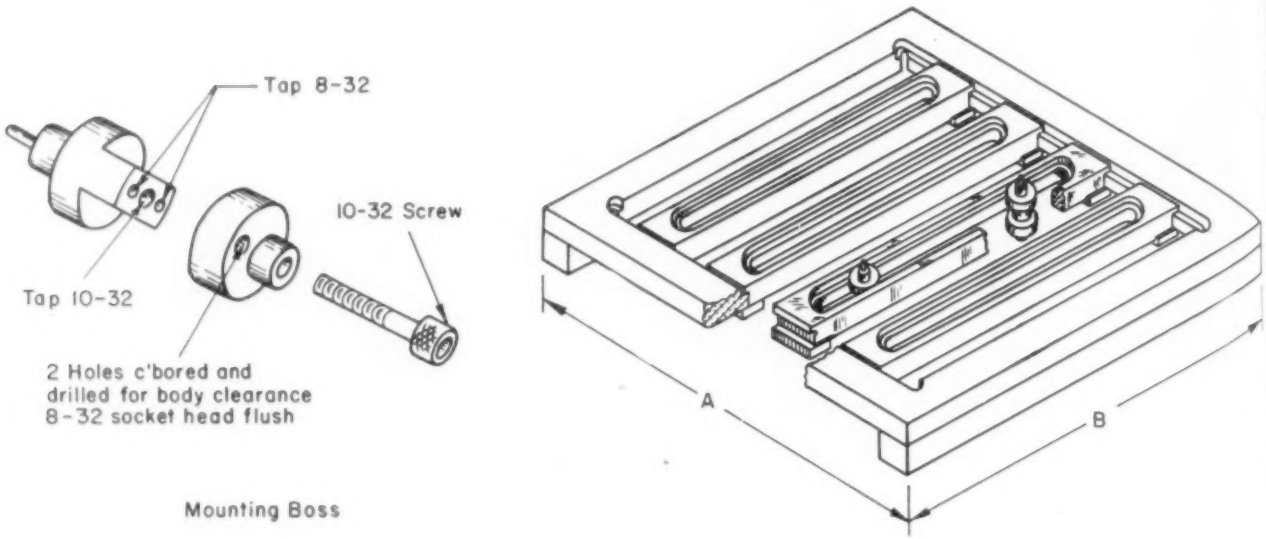
To duplicate parts with the jig, a metal template is first made either from a tool loft for prototype requirements or from ⅛ inch 24 ST-6 for limited production requirements.

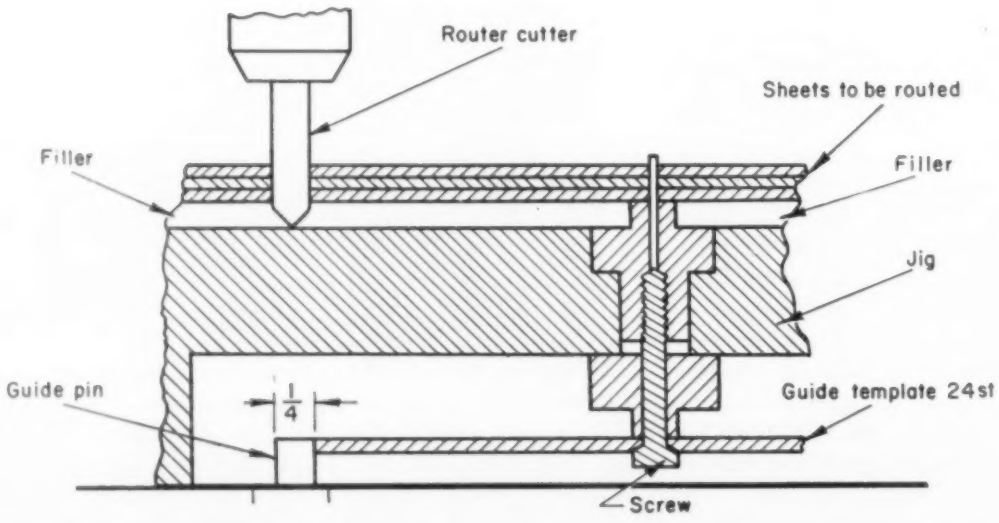
Number 10 size holes are located in the template for use in pilot drilling. Otherwise it represents a replica of the flat pattern required. Usually between 500 and 700 pieces can be made before it becomes necessary to make a new template of this kind. With careful handling as many as 2000 parts have been made.

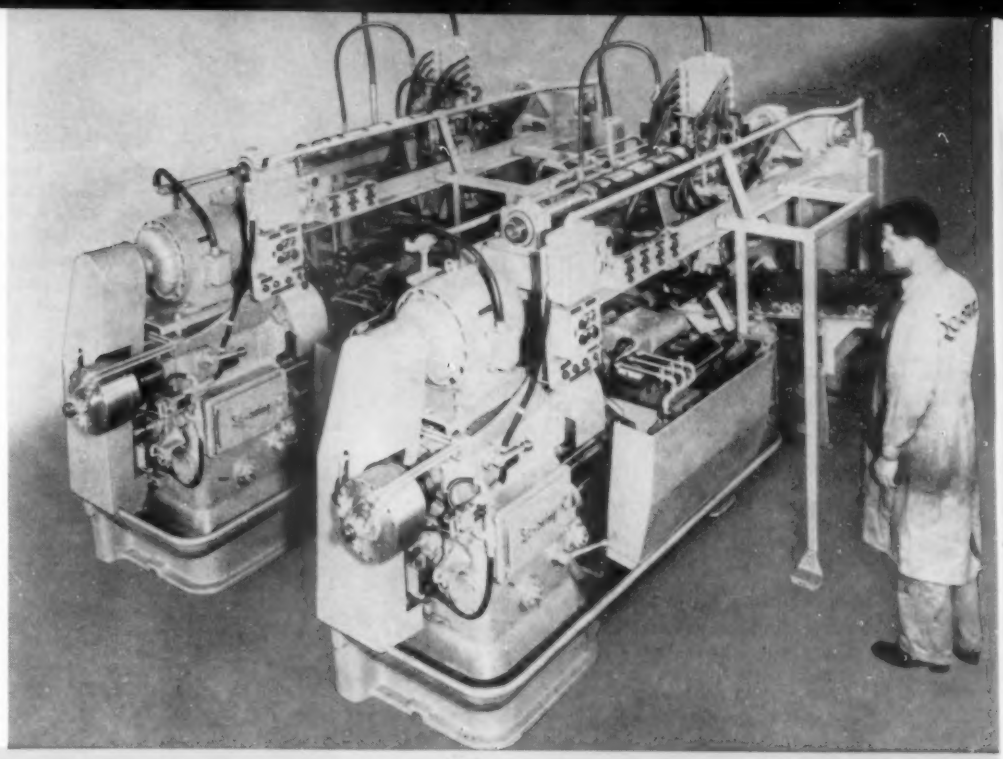
The procedure for production of parts with the template and universal router jig is simple. Using the template as a size guide material is sheared. It is then stacked and with the template clamped in place the material is stack drilled. Two or three of the drilled sheets are then placed on the jig, the floating bosses are oriented and the sheets placed on the pins. The ways are secured and guide template fastened in place. Drilled sheets are removed and filler, either ¼-inch cork or plywood is added. Purpose of the filler is to eliminate vibration and chatter and also to provide space between stock and tool so that the cutter does not damage the tool. The sheets are replaced on pins and routed in the normal matter.

Two universal router jigs can handle most parts. On one dimensions *A* and *B* are both 14 inches. On the other *A* is 28 and *B* is 21 inches.

O. Lango
Long Island Chapter







General layout of the two automatic lathes and the transfer carriers. Rough parts are loaded on the incline at the right.

AUTOMATIC TRANSFER

sinews of automation

METHODS FOR AUTOMATIC transfer of parts between machines, and automatic loading and unloading of parts at the machines are the heart of automation. A typical example of this is found in equipment designed and built by the Seneca Falls Machine Co., Seneca Falls, N. Y. Their most recent development is a multiple unit transfer machine used to turn and chamfer seven diameters on a cast camshaft. This equipment is designed so the basic material flow is in a straight line and other automatic operations can be added to the line both before and after the turning operations.

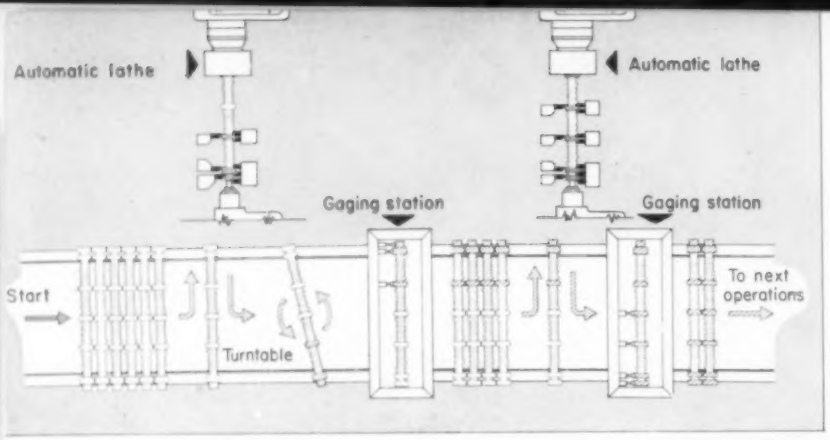
Rough castings, with ends milled and centers drilled, are loaded on an inclined ramp at the beginning of the automatic equipment. The parts roll down the ramp, are individually picked up, are transferred to and loaded in the first automatic Lo-Swing lathe, and are machined at one end. The semifinished part is automatically unloaded, transferred back to a turntable, turned end-for-end and elevated to a gaging station.

If within tolerances on all the surfaces machined, the part drops onto another incline that serves as the workbank for the second automatic lathe. The process is repeated with the remaining diameters being machined and gaged. From the final gaging station, parts within tolerances are deposited on another incline and roll to unloading.

Advantages of gaging each part as it is completed are that only good parts are on the ramps and the machine is shut down as soon as it produces parts outside of tolerance limits. Each gaging station controls the machine that supplies it with parts. If any diameter is outside of tolerance, the part is held in the gage, the machine that produced it is stopped at the end of its current cycle with the tools withdrawn, and signal lights indicate which dimension is off and in which way.

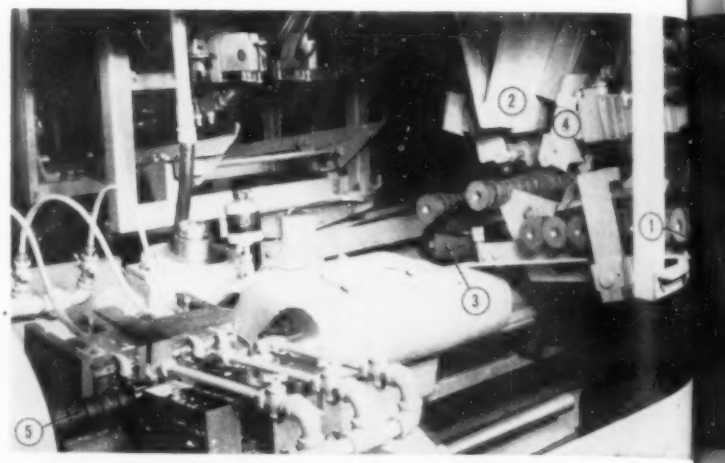
The tooling is designed for rapid replacement without setting at the machine. The front turning tools are fitted with adjusting screws that are preset in the toolroom. The rear facing and chamfering tools are mounted in magazine-type tool blocks that are preset in the toolroom.

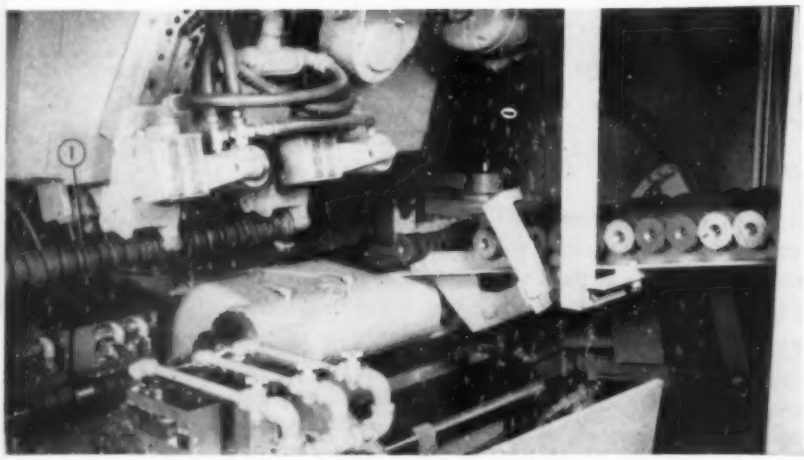
Two switches automatically shift control from each lathe to its transfer loader and back again. By this control, the machine and its loader cannot get out of phase.



2 Rough camshaft castings are manually loaded at the left and are then machined and gaged automatically. They are picked up individually by the transfer carrier and moved into the first lathe. Removed from the lathe, semifinished parts are turned end-for-end, gaged and moved into the second lathe. Parts are removed from this lathe, gaged and manually unloaded.

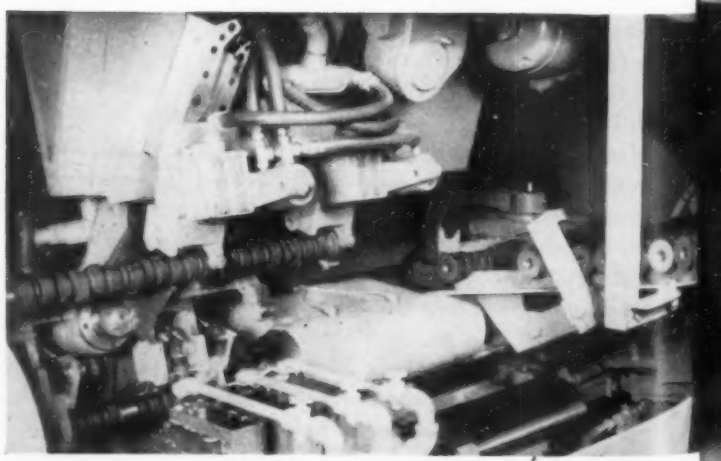
3 As seen from the chuck end of the first lathe, rough castings (1) are banked at the right. The transfer carrier (2) is stationed over the gravity conveyor in the work load-unload position. A semifinished part is in the turntable cradle (3) while a rough piece is clamped in the carrier fingers (4). The workpiece (5) is machined while the rough part is picked up.



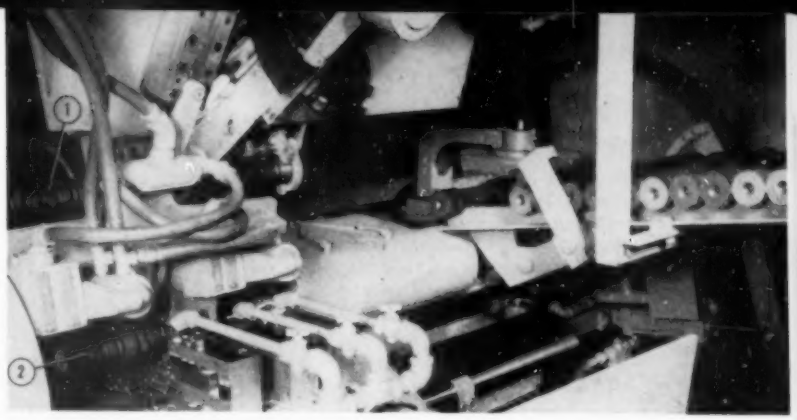


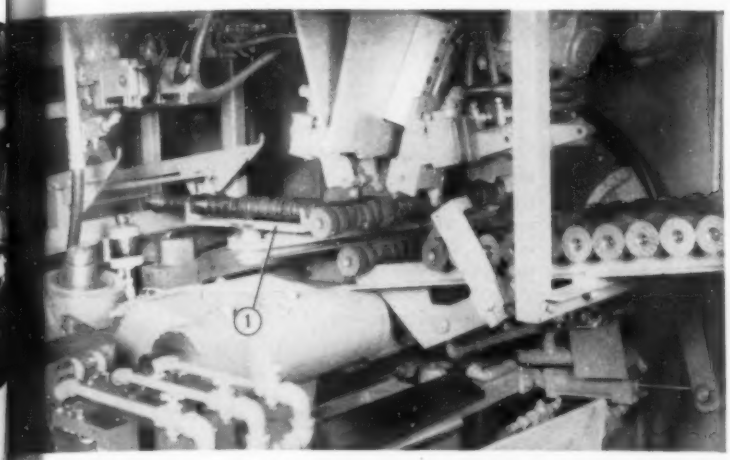
4 The transfer carrier has brought the next rough camshaft (1) across to the lathe load-unload station while still another rough part has moved down the incline to the pick-up position. The semifinished part (2) is held between centers but the toolroom-set front and rear tools have withdrawn, the headstock spindle has stopped and the deep-chuck jaws are open.

5 The transfer carrier is still stationed over the lathe load-unload position with the load fingers holding the next rough camshaft in the raised position. The unload fingers have descended and clamped the semifinished part, which the tailstock spindle still holds between centers. Automatically operated fingers on the inclined ramp release one rough part at a time.



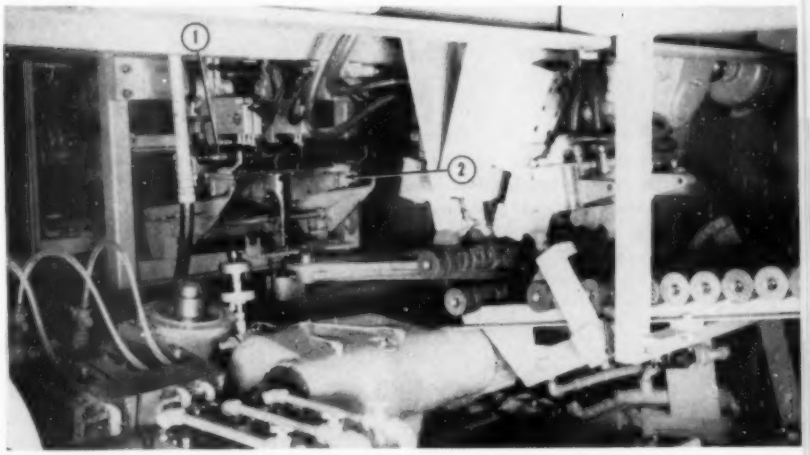
6 The tailstock spindle has retracted and the semifinished part (1) has been withdrawn from the deep chuck and raised. The loader, with a motion resembling two human arms, has injected the rough piece (2) between centers and will release it as soon as the tailstock spindle advances to hold the workpiece. Coolant is applied to the front tools through the pipes over them.

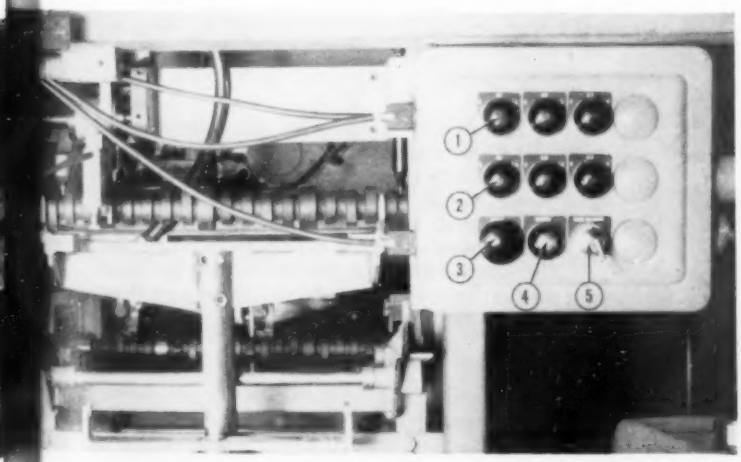




7 The rough part is now held between centers, the driving chuck jaws are closed and the headstock spindle clutch is engaged to start the machining cycle. The transfer carrier is at the work load-unload station and has deposited the semifinished part (1) in the turntable cradle. The next rough part has been injected into the clamps of the loading arm.

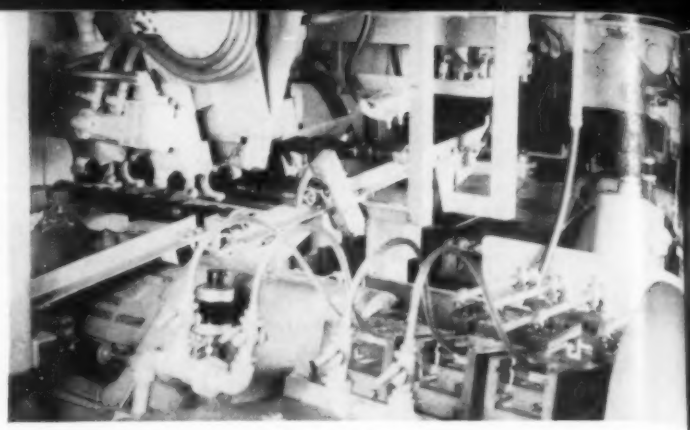
8 The turntable has completed turning the semifinished part (1) end-for-end and that camshaft has been raised by an air-operated elevator (2) into the gaging station. If the part is within tolerances on the three measured dimensions, the elevator descends and the part is deposited on the next inclined ramp to add to the workbank for the second lathe.

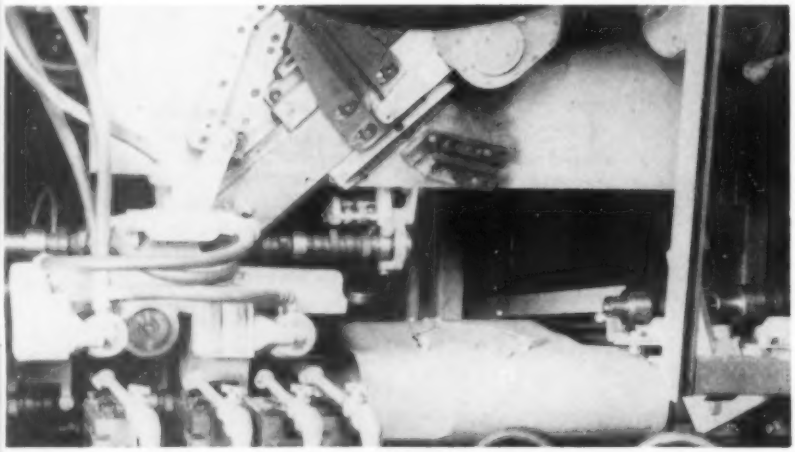




9 Close-up view of the first gaging station with a semifinished part in gaging position. The top row (1) of green lights indicate oversize dimensions when lit. The middle row (2) of red lights indicate undersize dimensions. The bottom row is a reset button (3), a light (4) indicating gage functioning and a gage by-pass lock (5). Part is supported by the cradle.

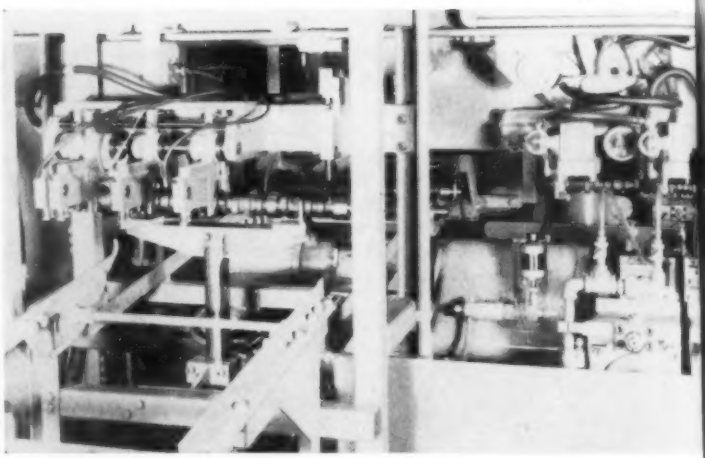
10 The semifinished part was found accurate and has been released by the gage. It is shown rolling down the second ramp to be added to the second lathe workbank. Space between the two lathes is sufficient to enable easy tool changing and to form a workbank of 20 parts so that machines can cycle independently. A larger bank could be formed vertically.

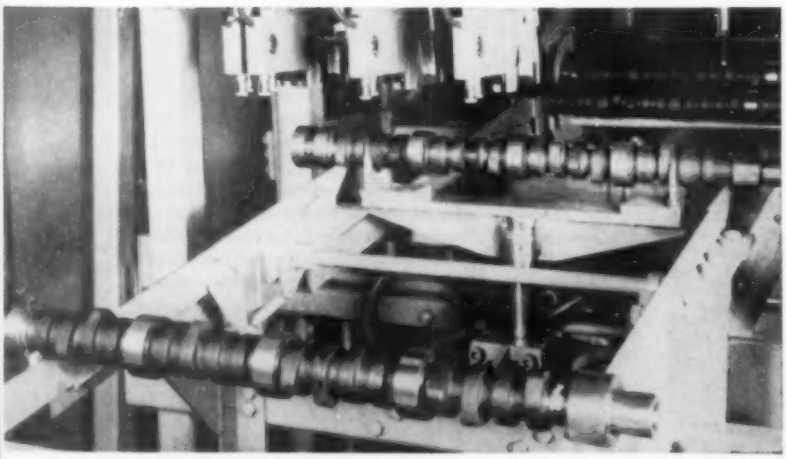




11 The second transfer carrier picks up a gaged, semifinished part and carries it to the lathe load-unload station. A finished part is unloaded from between centers in the same sequence as on the first lathe. The semifinished part is loaded into the chuck as shown. Side guides on the transfer carrier produce the required load and unload motions.

12 This view from the rear of the second lathe shows the transfer carrier in the lathe load-unload station with both arms relieved and ready for the return to the conveyor station. The final four diameters of a finished piece are being gaged. The two lathes and two transfer carriers do not necessarily work in the same cycle or at the same speed.





13 When released by the carrier, the finished part rolls down a ramp to the second gaging station. The elevator cradle comes up under it, pushes it through the hinged, spring-loaded catches on the final ramp and into the gages. When the elevator descends, it leaves the finished part on the final ramp, as shown. The part then rolls to the unloading station.

controlling
PRODUCTION QUALITY
by number of parts defective

By Martin H. Saltz

Quality Control Engineer
Hughes Aircraft Co.
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A STATISTICAL TOOL to increase coverage of quality control and overcome the objections of the $\overline{X}$ and R chart is the fraction defective or p chart. Although the $\overline{X}$ and R chart is the most sensitive statistical tool available for quality control work, it has certain disadvantages. It is only applicable to inspection by variables, that is, where a characteristic is actually measured. Again, a separate chart is required for each dimension or characteristic being inspected. Thus, innumerable charts would be needed to control all characteristics of a part. The p chart is applicable where inspection is performed by attributes, *Fig.* 1. In other words where a part is determined to be "good" or "bad," or checked on a "go, not-go" basis.

The p chart is designed for large volume production. Since it is less sensitive than the $\overline{X}$ and R chart, it is often used to provide a broad picture of quality level and as a guide to determine whether it would be worthwhile to apply the $\overline{X}$ and R chart.

When dealing with an operation or process producing parts in relatively large numbers, chance factors in the process usually result in some of the units being defective. The number of defective units divided by the total number of units produced is referred to as Fraction Defective in quality control terms and is designated by p.

Without indicating which parts coming from the process will be defective, this statistical tool does give the probability of drawing a defective unit in a sample of parts. If samples are drawn from a production operation and grouped according to the number of defectives in each sample, a histogram, as shown in *Fig.* 2, results.

The length of each ordinate can be calculated with the binominal equation and with the number of samples.

$$y = \left(\frac{n!}{(n-r)!\ r!} \quad p^r q^{n-r} \right) S$$

where

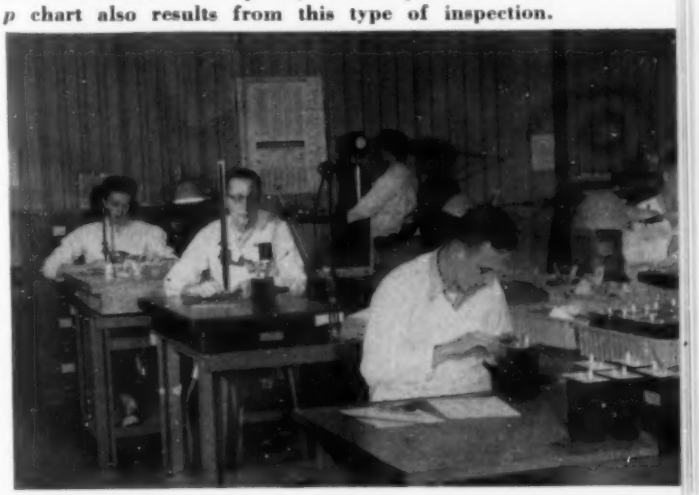
n = Sample size

p = Previously determined fraction defective of the process

q = 1 minus the fraction defective of the process

r = Number of defectives in the sample

Fig. 1. Inspection by attributes of production lots results in acceptance or rejection of individual parts. The accumulation of quality data required for the p chart also results from this type of inspection.



S = Total number of samples

y = Number of samples having r/n fraction defectives.

The binominal equation gives the probability of drawing from a process a sample of a certain fraction defective. If this probability is multiplied by the total number of samples being drawn, a histogram such as that shown results.

This histogram indicates that the fraction defective of a production process cannot be predicted by calculating the fraction defective of a single sample from the process. Due to various factors that affect the process and sampling, the sample fractions defective will form a histogram as shown rather than a single value.

If the fraction defective produced by the process, even though it may not necessarily be known, remains constant, the ordinates of the histogram can be calculated.

It would be desirable to establish limit lines to indicate whether the process is being affected by unavoidable chance causes or whether assignable causes are being introduced. By convention, certain standards have been established for control limits. If a sample is taken from production that is in statistical control and the fraction defective calculated, it fits into the histogram as developed by the process. If, however, it falls outside, then the operation is out of control and an assignable cause is indicated.

A precedent must be established in order to determine how much variation can be tolerated in the fractions defective of samples before it can be assumed that an assignable cause has developed. This is established so that approximately 99 percent of the time, if a value for fraction defective falls outside the limits it is a true indication of an assignable cause. This value is designed as the 3 σ limits.

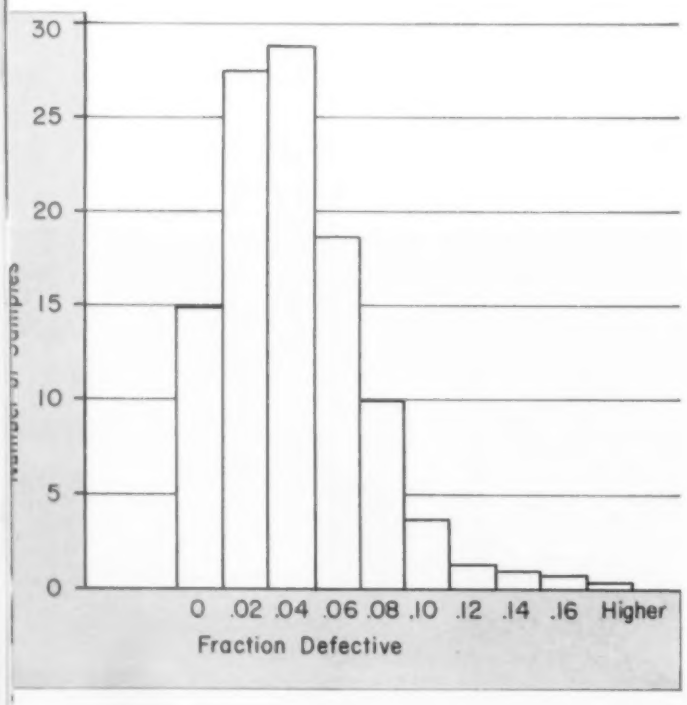


Fig. 2. Histogram of 100 samples showing the variation of fractions defective, sample size of fifty. Production was actually four-percent defective.

For the fraction defective control chart, σ_p is estimated by the following equation:

$$\sigma_p = \sqrt{\frac{\bar{p}\ (1-\bar{p})}{n}}$$

where:

n = Sample size

$\bar{p}$ = Average of the fraction defective in the samples.

If control limits are established at $\pm\ 3\sigma_p$ as shown in *Fig.* 3, the following equations express relationships of upper and lower control limits for the fraction defective.

$$UCL_p = \bar{p} + 3\sqrt{\frac{\bar{p}\ (1-\bar{p})}{n}}$$

$$LCL_p = \bar{p} - 3\sqrt{\frac{\bar{p}\ (1-\bar{p})}{n}}$$

In order to simplify the calculations, a chart, *Fig.* 4, has been prepared showing a relationship between 3 σ_p, $\bar{p}$ and n. Making use of this chart, when $\bar{p}$ and n are known, a value of 3 σ_p can be obtained and control limits then become:

$$UCL_p = \bar{p} + 3\sigma_p$$

$$LCL_p = \bar{p} - 3\sigma_p$$

Controls for the p chart should be used on no less than 20 samples. The chart used for solving for 3 σ_p is based on a $\bar{p}$ value expressed as fraction defective, and therefore, when this chart is used the values should be expressed as a fraction defective. However, depending on individual preference, control charts of this type can be maintained on either a decimal defective, or a percent defective basis.

The transposition from ordinates for the histogram and the limit lines shown in *Fig.* 3 to the control chart as used in the shop, is a simple one. The limit lines are merely transferred to the control chart. For sake of simplicity, the actual drawing of the distribution is dropped. If in calculations the lower control limit becomes minus, it is expressed on the control chart as 0, since there can be no negative values of fraction defective.

Several steps are required to set up a p chart for a typical situation. A power press, stamping out

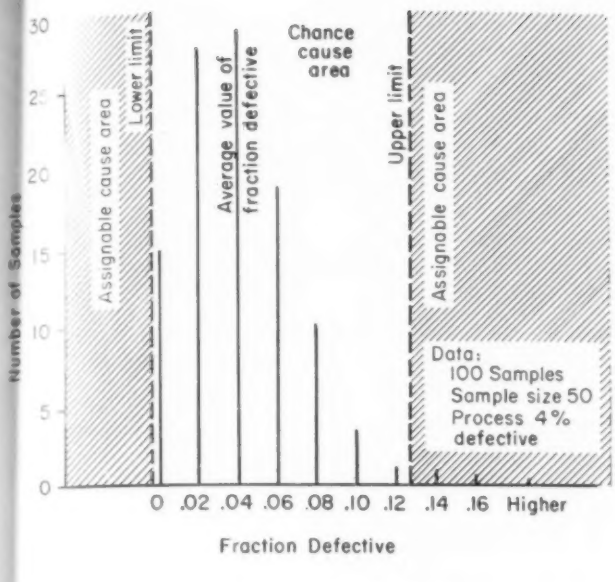


Fig. 3. Ordinates of binomial distribution with limit lines, based on same data as *Fig.* 1.

parts at a rate of approximately 200 per hour, can be used for an example. The parts are armature laminations being inspected for such characteristics as hole diameter, over-all diameter and flatness. Because of the difficulty in measuring these characteristics and the low cost per unit, produced parts of this type are most frequently inspected by attributes, i.e., as to whether they are good or bad. This, together with the fact that such parts are usually produced in large numbers, makes them ideally suited for analysis by a fraction defective control chart. The parts submitted for inspection and the fraction defective found are assumed to be as shown in TABLE 1.

The fraction defective for each of the inspection lots is computed. The computed values are plotted as shown in *Fig.* 5. This form has three sections: *Fig.* 5A, the section used for identification of the part and process; *Fig.* 5B, the part used for recording the data; and *Fig.* 5C, the grid area for plotting the points.

As with other control charts, a scale must be established to plot values as calculated. Establishing a suitable scale and transferring data to the *p* chart form gives a chart substantially as shown in *Fig.* 5.

The control limits are based on the sample size taken. In the example shown, a different set of control limits would be necessary for each of the different sample sizes. In practice, such a situation is to be avoided as it causes the control chart to appear rather confused. To avoid this difficulty, either the sample size should be fixed at a particular value or else an average sample size should be used as a basis for the computation of the control limits. Taking the latter case as an example, an

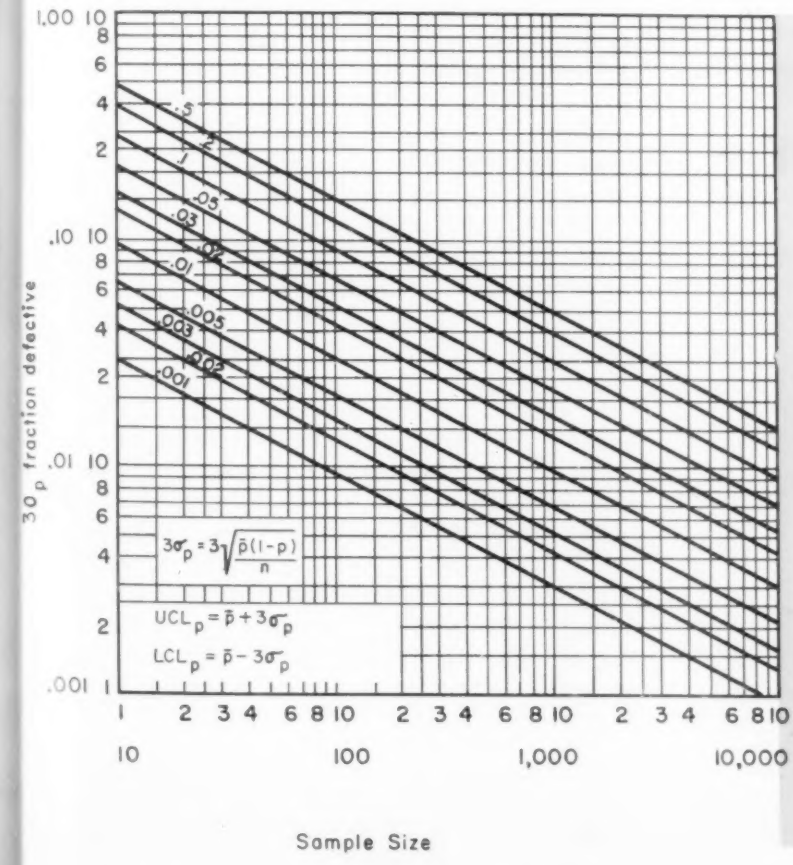


Fig. 4. Nomograph for computing *p* chart control limits of 3 σ_p.

average sample size of 100 is assumed. Actually, this approach results in the introduction of certain errors. The gain in the administration of the scheme, however, far outweighs the degree of error.

Next it is necessary to compute the average fraction defective. From the data secured for the first twenty samples, this value is equal to 540 divided by 2,700 or 0.20. By reference to the chart in *Fig.* 4, 3 σ_p is determined to be 0.12. Thus, the Upper Control Limit becomes 0.32 and the Lower Control Limit becomes 0.08. With these limits shown on the control chart along with the value for $\bar{p}$, the completed chart appears as shown in *Fig.* 5.

Table 1—Results of Sample Inspection

Sample	No Inspected	No Defective	Fraction Defective
1	200	44	0.22
2	150	33	0.22
3	150	25	0.17

In this instance the sample size was actually the production that was completed in the elapsed interval. Due to this, the problem of different sample size occurs. Therefore, the limits were arbitrarily based on an average. In shop experience this frequently is the case.

Data used for the example is the type that is usually available as part of the regular inspection routine. A chart such as this could therefore be set up with little disturbance to established procedures. If conditions in the shop are such that it is possible for a particular operation to fix the sample size at a constant value, it might be desirable to plot the number of defectives, instead of fraction defective. A chart of this type is called an *np* chart and is actually a special case of the fraction defective chart. It has the advantage of eliminating the calculation of the fraction defective and it is also more easily understood by shop personnel. It is desirable, however, that a company establish a policy for *p* charts or *np* charts to avoid confusion and misunderstanding that may occur if different types are used simultaneously.

The first set of control limits, as computed, is usually referred to as "trial control limits" and should be based on no less than 20 samples. Actually previously collected data may be available. If so, computed control limits will be immediately effective on current production and no time will be wasted.

With the *p* chart it is frequently found that changes in production methods or design will result in a general shift either high or low. This would be indicated by consecutive points appearing either above or below the $\bar{p}$ value. If this is the case then it would be advisable to recompute the control limits to give a more current picture.

In addition to its use as an indicator of assignable causes, the *p* chart has the advantage of showing capability of a process in producing a product at a particularly quality level (fraction defective, defects per 100, etc.). Depending on the value of the product and the cost to maintain it at the $\bar{p}$ level, it may be desirable to take action which will either increase or decrease the fraction defective of the process. If the number of defective parts being produced is low, then for the *p* chart to be an accurate indicator, the samples must be relatively large. If, however, a large number of defective parts is being produced, then smaller sample sizes are adequate.

If the areas in a plant are set up on a roving inspection basis, then the samples should be taken by the inspectors as they make their rounds. In this way the sample size can be established at a convenient value and the problem of varying sample size is eliminated. In the example, the *p* chart was applied to a single process; however, it has a further advantage in that is can be applied to maintaining control over departments or areas and can be used as a basis of comparison between groups performing the same, or similar operations.

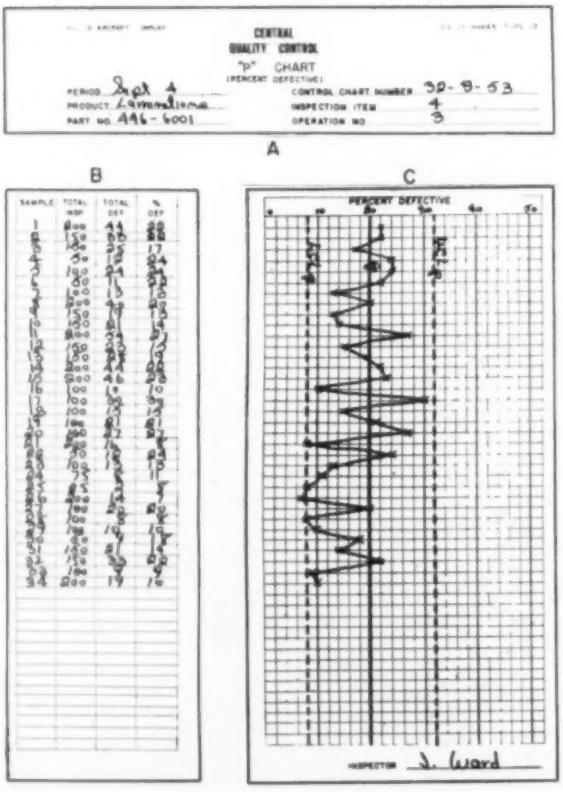


Fig. 5. Typical *p* chart with heading, columns for recording data and a grid for plotting percent defective.

production DRILL HEAD

unit for building-block machines

By **Clarence Johnson**

Development Engineer
South Euclid, Ohio

ONE OF THE IMPORTANT phases of American mass production has been the development of special automatic machine tools that combine the operations and functions of several machines, thereby reducing handling of the workpiece. In mass production, for instance, large parts are now fed into one end of large transfer machines and emerge at the other end completely machined.

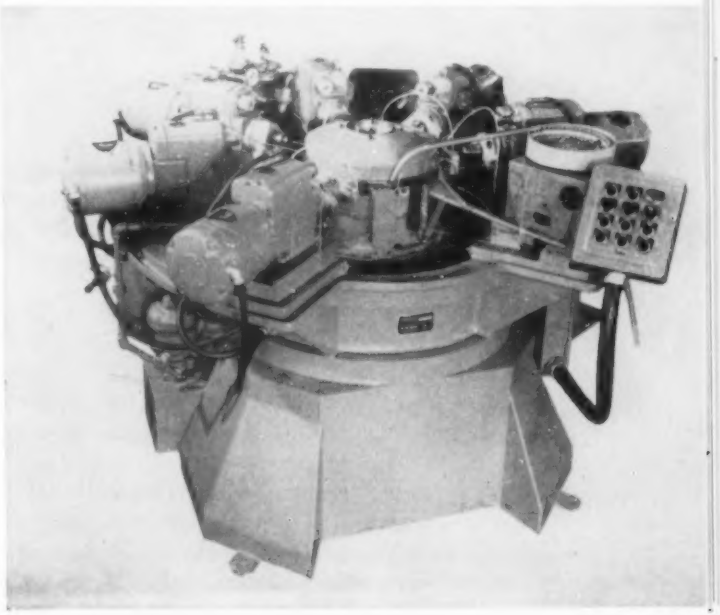
These transfer machines are complicated and costly, and in general, their components are special and difficult to salvage when the design of the manufactured part is changed. This type of machine has been beyond the reach of the small manufacturer and is not used for small parts.

The development of reasonably priced, standard, versatile, packaged power units that can be added like building blocks to other standard units to produce machines, *Fig.* 1, has made available to small shops and manufacturers of small parts the possibility of money and time-saving advantages with increased production. In many cases the cost of these building-block machines is conderably less than that for standard machine tools required to make the same part.

When the design of the workpiece is changed, the power units can be moved on their bases or can be transferred to new bases and put together again in an entirely different arrangement to accommodate the new design. Bases on which the units are mounted are as simple or as elaborate as necessary. Some are standard multiple-spindle drill press tables while others are complicated weldments.

Even on simple jobs these units often show large

Fig. 1. Typical of special-purpose machines that can be built up of standard units is this hopper-fed completely automatic machine that can be easily altered to accommodate changes in design.



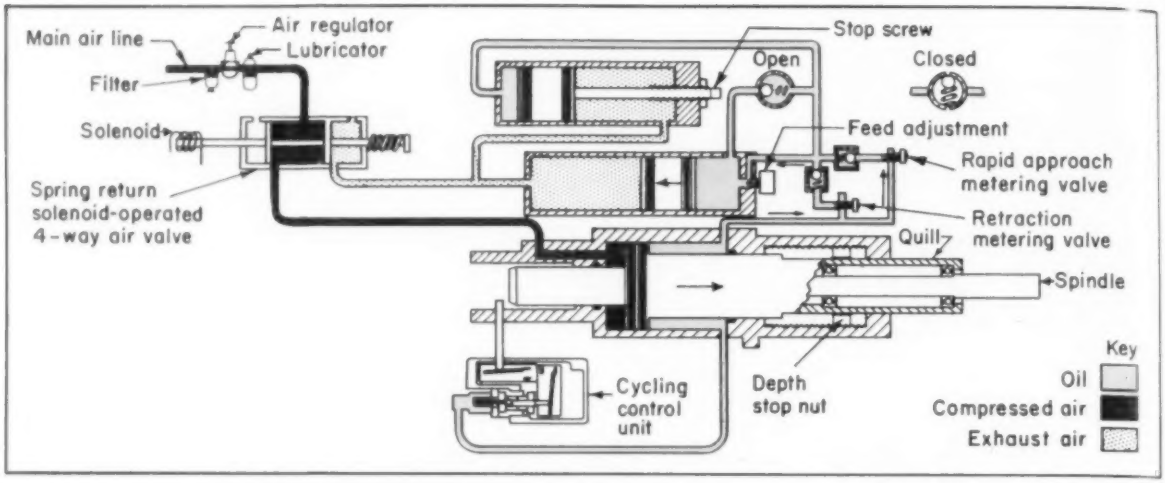


Fig. 2. Elements of the hydraulic and air circuits at the end of the rapid advance stroke. The rapid advance piston (top) has stopped against its adjusting screw but the feed piston continues to move.

savings. One reason for this is that the tools revolve and feed while the work remains still. It is unnecessary to stop and start the machine for loading and unloading so that chucks, clutches and brakes are not required. Since the workpiece does not rotate, balance is no problem and simple clamps can position and hold it. If there are several stations, work can be loaded and unloaded during the machining cycle.

A Typical Drill Unit

There are a number of such building-block units available. Results obtained with these units are similar although their operating principles vary radically. For such use, the Rockwell Manufacturing Co. manufactures motor driven drill units, the feed for which is a combination air hydraulic system. These Rockwell Drill Units* take motors from ⅓ to 5 hp and can accommodate drills from No. 80 to 1⅛ inches in diameter. Since the drives can be direct, or through pulleys or gears, almost any desired speed can be obtained. These units can be used for a variety of operations such as drilling, tapping, threading and box turning. The most recent of these units, the Model 19-600, is the largest and a discussion of it will indicate the possibilities inherent in packaged units.

Air-Powered Hydraulic Circuits: In the air-powered hydraulic circuit, oil pressure is generated by compressed air without need for hydraulic pumps, reservoir or reducing valves. Since there is no pump to lubricate, thin aircraft oil can be used. Viscosity of this oil changes little with temperature so that feed rates remain constant throughout the day. The stored energy features of compressed air and the flexible control of hydraulic systems are combined in this circuit. The circuits of all the Rockwell Drill Units are similar but refinements in the 19-600 allow more control of the stroke.

The hydrualic circuit consists of a body of oil sealed in by three pistons operating in three cylinders, *Fig.* 2. The cylinders are interconnected by oil passageways that contain the means for control. The main piston is integral with the quill of the drill unit. The feed and rapid-approach control pistons are free floating and serve as separators between the compressed air on one side and oil on the other. During the cycle, compressed air is applied first to one end of this hydraulic circuit and then the other.

At the start of the cycle, the solenoid-operated four-way air valve is set to apply air pressure to the main piston and exhaust air from the rapid approach and feed cylinders. Air pressure on the main piston is partially balanced by oil pressure on the opposite side of the piston. This oil pressure results from the resistance of valves and oil passageways. Back pressure in the oil line to the rapid approach cylinder is normally low. As a result, the main piston moves forward rapidly until the rapid approach piston abuts against its adjustable stop screw. Because of the accurate quantity of oil acquired by the rapid-approach cylinder, accurate and positive internal control of the rapid-approach stroke of the main piston is achieved repetitively without external control rods and valves. At the same time, the same oil pressure is transmitted to the pressure element of the cycling control element.

The positions of the elements at the end of the rapid-approach portion of the cycle are shown in *Fig.* 2. The rapid-approach piston completely blocks entry of more oil into the rapid-approach cylinder and, if the oil could not find some other path, the main piston could not move. However, with the

*Originally trademarked "Delta-Milwaukee."

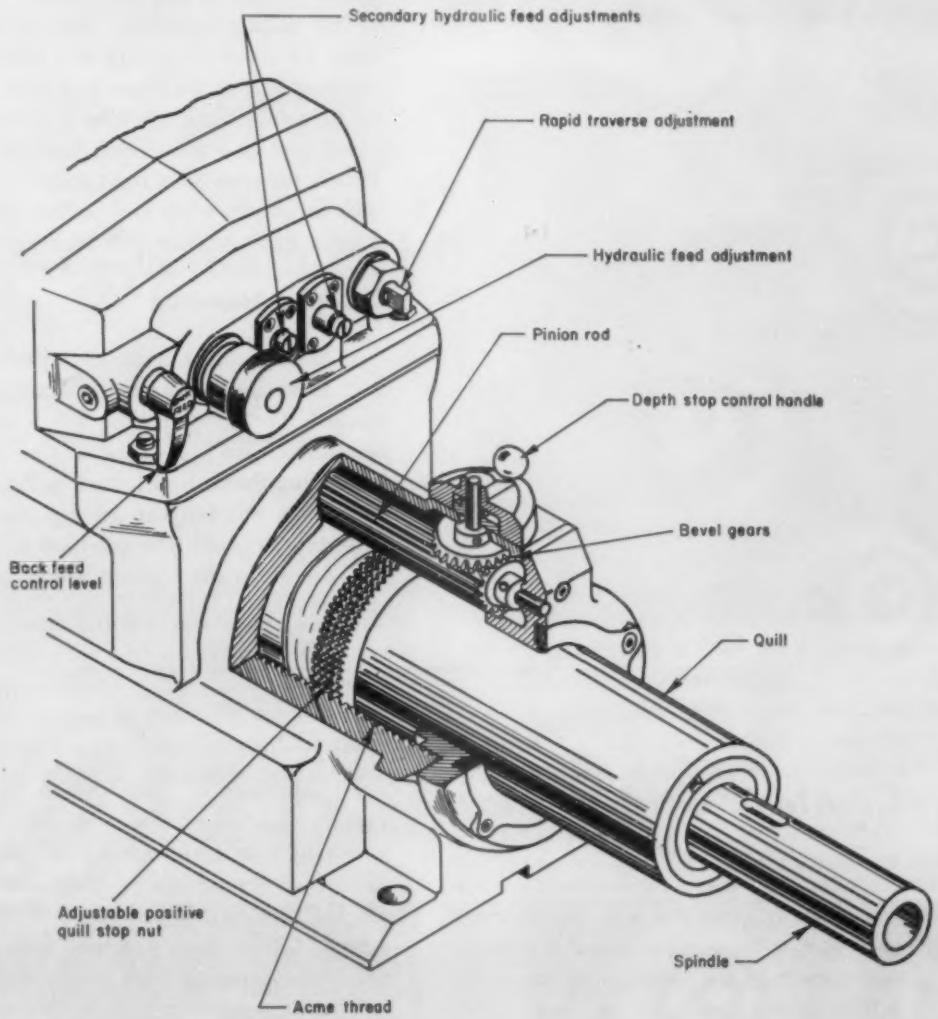
feed adjustment valve open, the main piston can move forward by forcing oil through the feed-adjustment valve into the feed cylinder. The feed-control piston moves back as oil enters the feed cylinder from the main cylinder. The main piston moves forward at a rate established by the setting of the feed adjustment valve.

The main piston continues forward until the quill abuts against the depth stop nut. Further forward movement of the quill is instantly and positively prevented. This removes force from the oil and the oil pressure drops instantly, which reverses the pressure sensitive switch and consequently the four-way air valve. Compressed air is then applied to both the feed and rapid-approach pistons while the main cylinder is exhausted. The main piston returns to the starting position as a result of oil pressure. During normal operation, the feed-adjustment ball check valve opens to permit rapid return of the quill to the starting position.

Since there are applications where it is desirable to return the quill at the same rate as that for forward movement, such as in tapping, the ball check can be blocked off and the unit will feed in both directions. In order to obtain complete control of the unit, two ball and two metering valves have been added so that the rates of the strokes can be equalized. These additional valves also make it possible to control the rates of rapid approach and return. In effect, two forward and two return feed rates are available.

Positive Quill Stop: The positive depth stop control, *Fig.* 3, embodies a set of bevel gears driving a pinion rod. The pinion rod meshes with an unusual external gear-nut on which gear teeth are

Fig. 3. Positive depth stop positioning is obtained by driving the pinion rod with a set of bevel gears. The pinion rod meshes with the external gear-nut, which turns in an internal thread in the housing.



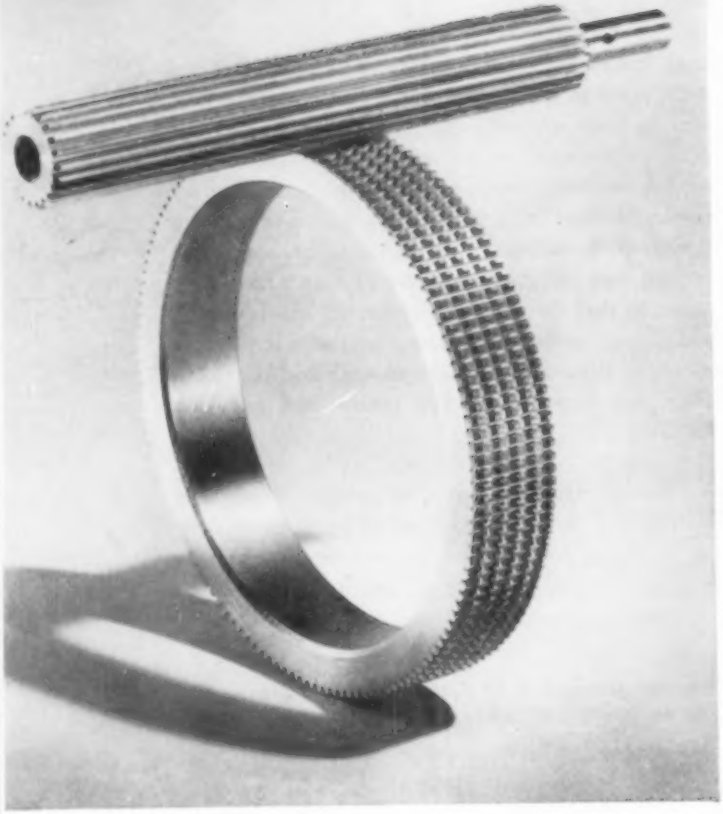


Fig. 4. (left) Unusual feature of this drill unit is a single part that functions both as an externally threaded nut and an external gear.

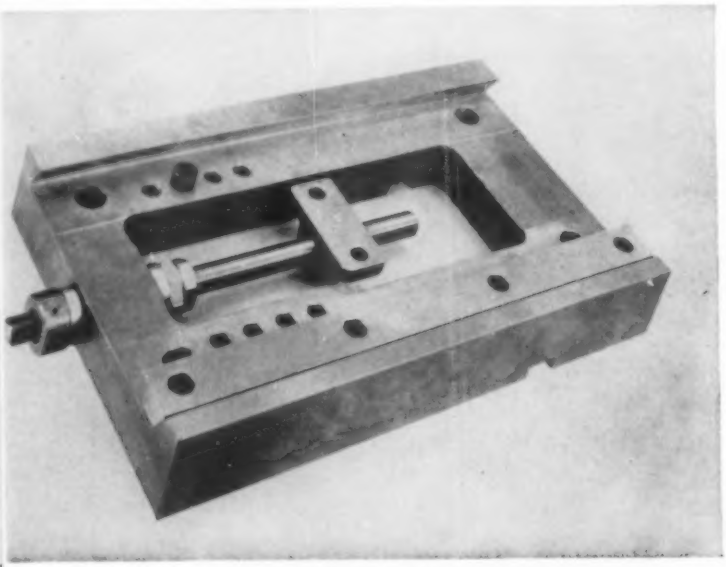


Fig. 5. (below) Sub-base for use with drill unit so that unit can be withdrawn from the work area to facilitate tool change.

cut in the thread, *Fig.* 4. The gear-nut advances and returns in a thread cut in the main body and can be positioned to limit quill stroke anywhere between 0 and 6 inches. The gear-nut stops the quill positively with less than 0.0005-inch variation.

Cylinders: Cylinder finish is critical in hydraulic machinery because packing life and leakage are functions of the finish. Bored, honed and chromium plated cylinders were used at first, but so much trouble resulted from small pits that other materials were tried. The final solution is a brass liner inside a steel cylinder. The steel cylinder is bored and then a brass liner, with a 1/16-inch wall thickness, is lightly pressed in and then rolled.

The rolling operation expands the inside diameter by about 0.010 inch and some excess brass is squeezed out at the lower end. The excess material is trimmed off and the tube is bored with a round-nosed tool at a 0.003-inch feed on a turret lathe. This is followed by a light polish, a 0.001 to 0.002-inch chromium plate and buffing. This process produces a finish of from 5 to 10 microinches, rms.

Sub-Base Mounting

If building-block units of this type can be pulled back from the work area, tool changing is more convenient. To facilitate this, a sub-base, *Fig.* 5, has been developed. This base has an adjusting screw for sliding the drill unit back and forth on dovetail ways. One dovetail can be tightened to clamp the drill unit in place. The sub-base is firmly bolted to the base of the machine on which the drill unit is a component.

Navy Creates Multi-Use Alloy

SUBSTITUTE METAL to use as a replacement for certain stainless steels is promised with development of Thermenol by the Naval Ordnance Laboratory. This is a modification of 16-Alfenol, a soft magnetic material developed previously in the Navy Lab's Magnetics Div. Metalurgists found that by making small additions of such metals as vanadium or molybdenum, coupled with suitable heat treatment, increased heat resistance of the alloy. Thus was created a new group of heat-resistant alloys, of which Thermenol is one member. From 20 to 25 percent lighter than stainless, with physical characteristics including high tensile strength and high resistance to corrosion or oxidation, forecasts an active future for the new material.

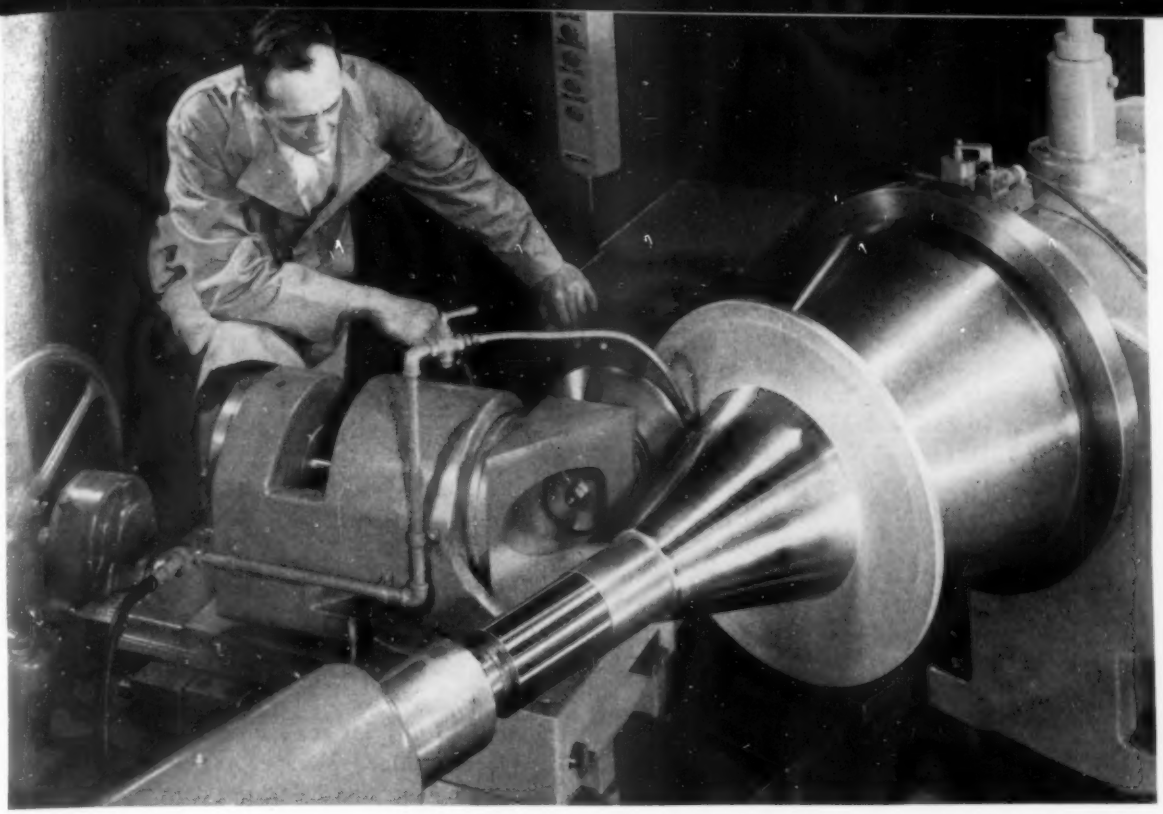


Fig. 1. Forming a jet engine exhaust cone. A hardened disk cold flows a metal blank to the shape of the mandrel on the lathe spindle.

flow forming proves economical for symmetrical shapes

By Ralph H. Eshelman
Associate Editor

OVERCOMING many of the disadvantages of other processes for cold forming metals, a new method recently developed by Lodge & Shipley offers many interesting possibilities. Superficially resembling spinning, the process is basically simple, though requiring equipment specially designed for the purpose. A metal blank is gradually forced to flow under the pressure of a revolving disk against a rotating mandrel which is the shape desired for the finished part, *Fig.* 1.

Once the tool carriage has been adjusted to the proper angle so that the slide moves parallel with the mandrel, the operation becomes semiautomatic, requiring only that the operator load and unload the parts and start and stop the machine. The initial setup itself is not difficult, requiring only an adjustment which is made by bringing the forming disk in contact with the mandrel at the small end and the large end in order to secure the proper angle.

While embodying some of the principles of spinning, the flow turn process, as it has been termed, is quite distinctive in that parts formed have their own characteristics. For one thing, the diameter of the part blank and of the finished workpiece is the same, as indicated, in *Fig.* 2. As shown in this sketch, the thickness of the portion of the part which is actually formed is reduced whereas the end where the part is held and any flange which is left remain the original thickness of the blank. Greater uniformity and consistency are secured in this process than by spinning, as wall thickness can be held to a variation of 0.002 inch.

Spindle speeds used are rather low, depending upon the size of the part, material and other considerations, varying from less than 100 rpm to close to 1000 rpm. Commonly, a coolant is used in the process applied copiously by pressure system to the

point of contact of the forming disk with the workpiece. Coolant used is not critical, a standard type being satisfactory.

Applications

Of the variety of parts produced to date, many of them have been designs difficult to manufacture by conventional processes. Often they involve hard-to-work materials such as many of the stainless steels, Timken 16-25-6 and 17-225, Haynes Multimet, Uniloy 19-9, Inconel X, Monel and K-Monel and Titanium T1-140-A. Some of the typical shapes produced, *Fig.* 3, indicate the range of possibilities on present equipment. Parts up to 42 inches in diameter and 50 inches in length have been formed and, with special equipment, even larger dimensions may be handled. Blanks of the harder metals have been worked up to a thickness of 5/16 inch, while softer metals up to ½-inch thick have been formed in such materials as boiler plate, copper, aluminum and mild steel.

The jet engine exhaust cone, shown in the process of being formed in *Fig.* 1, is typical of present applications. Formerly the part was stamped in two halves and welded. Produced this way, it was difficult to make and unsatisfactory in service. The material, AMS-5510, stainless proved to be readily flow-formed securing much higher strength parts due to the elimination of the weld and to the fact that the cold working increases the tensile strength of the metal.

Application of the process has also been successfully extended to working pieces which have previously been forged, cast, machined, seam welded, partially drawn or otherwise processed. The part shown in *Fig.* 4, for example, was previously forged and then machined to shape. As originally produced the forging cost was $98.00 per part and machining time required was 2¾ hours on a Bullard lathe. As flow-formed, *Fig.* 4*b*, the part is initially forged to the shape shown at right at a cost of $36.00 per part

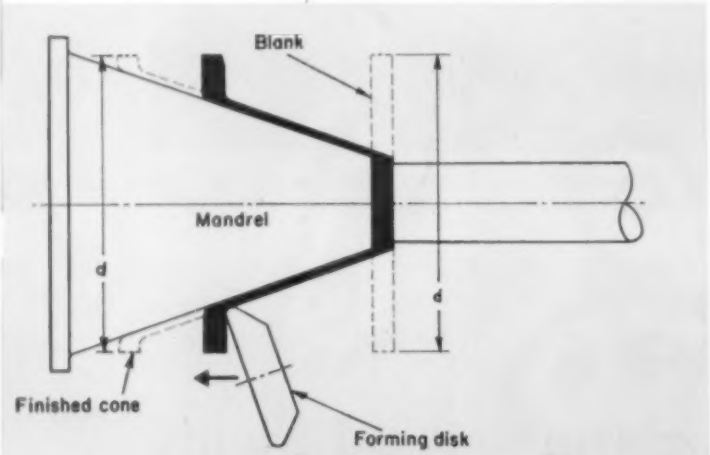
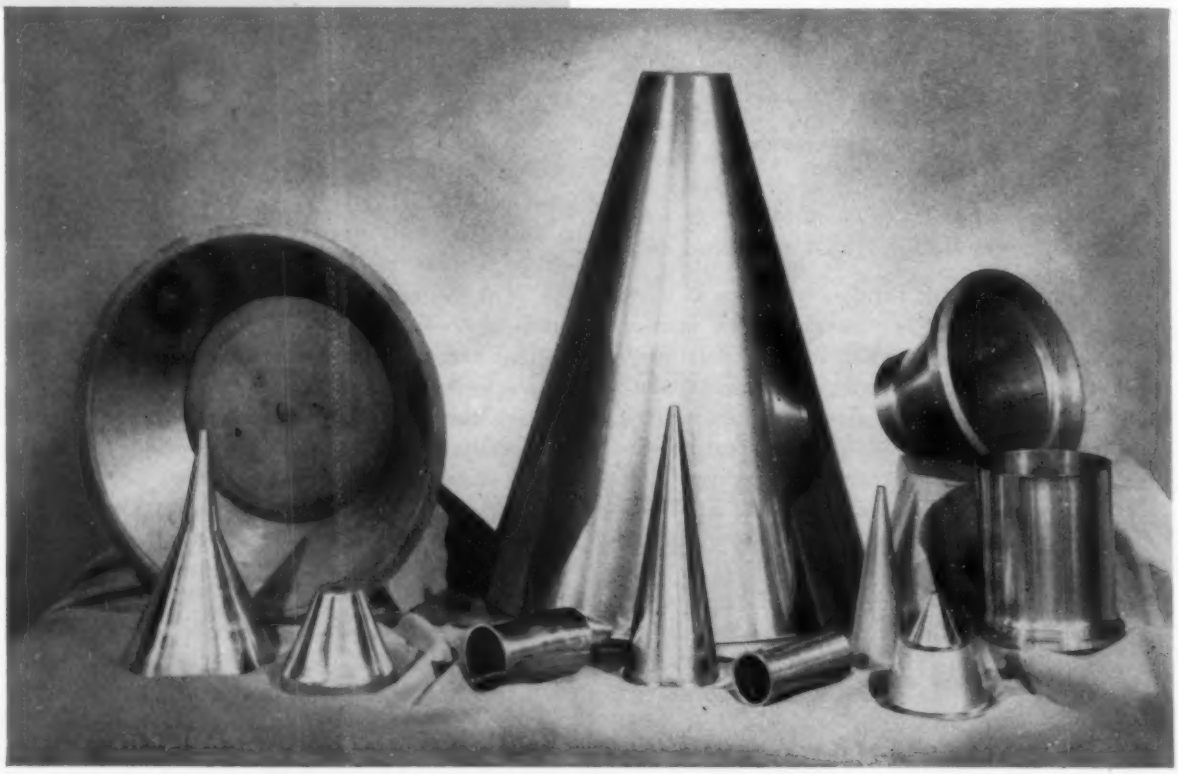


Fig. 2. (left) Schematic diagram depicting principle of the flow turning process. The diameter of the blank and the finished part are the same.

Fig. 3. (below) Typical parts formed successfully by flow turning include cone and cylindrical shapes in various combinations and a range of sizes.



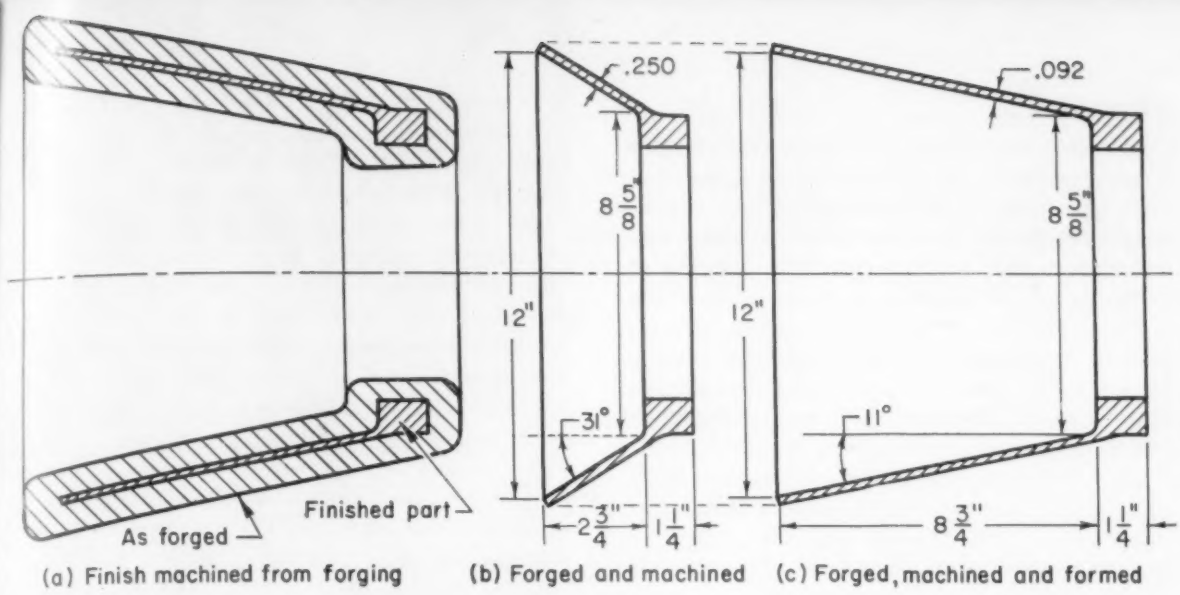


Fig. 4. Flow turning was used to complement forging this part. Extensive machining was required when part was produced as at *a*. Forging dies were expensive and damage excessive. Part was more easily forged and machined as shown in *b*, then flow turned to final form as in *c*.

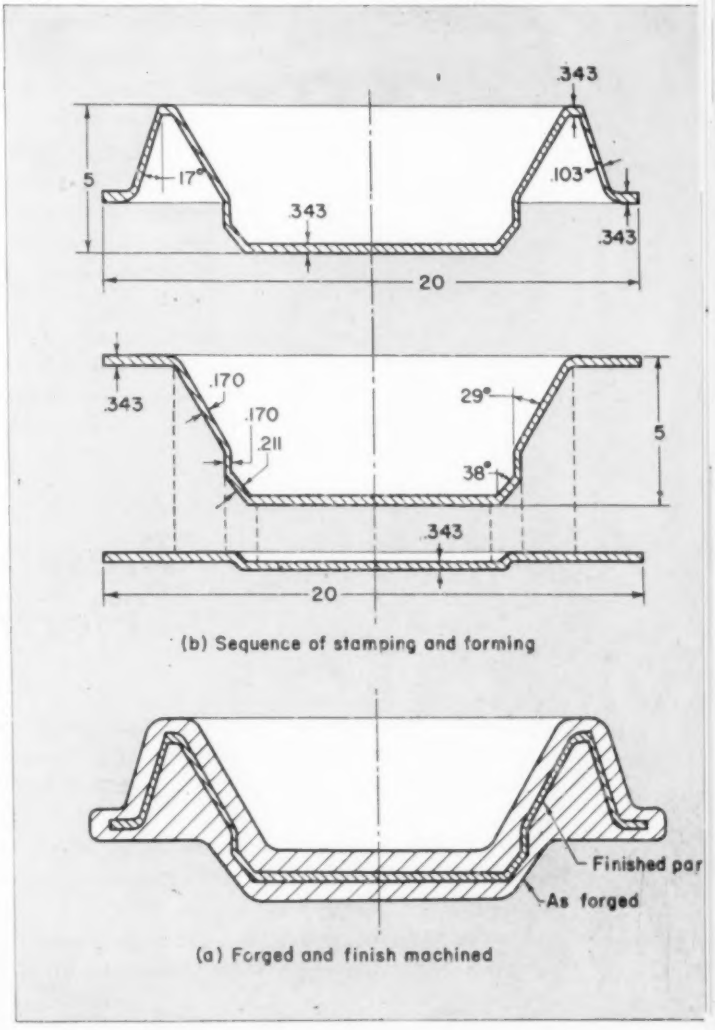
and then flow turned to finished shape. Machining time required now is forty-five minutes in addition to the flow forming time of six minutes, making a production time of fifty-one minutes as against the previous 2¾ hours. Thus, a saving in production time of 1 hour, 54 minutes per part has been gained.

Even more dramatic savings have been secured in other instances of parts which are poorly suited to other production methods of metalworking or forming. Such a part, shown in *Fig.* 5, was formerly forged, *Fig.* 5*a*, and machined to shape as the only practical means of production even though it was not a desirable forging application. The part is now flow turned from a prestamped blank, shown at the bottom, *Fig.* 5*b*, requiring three steps or passes. Material savings alone in this and similar cases were over 75 percent of the original forging cost.

The solution to another production problem was found by using the flow turning process to produce a part of AMS 3551 stainless, *Fig.* 6. It had been extremely difficult to machine previously because of thin walls required in the finished part. It was found that the part could be produced as a centrifugal casting and then roll extruded in two passes. The part is machined now before flow turning.

In forming cylindrical parts a special technique is used. The blank consists of a piece of flat stock of predetermined thickness wrapped and welded to cylindrical shape. This is then readily flow turned to the finished part. This method has also been successfully used with open end cones. Examination of microstructure of the welded seam of the flow turned part showed it to be improved in quality, filling the seam more compactly. Tests indicate that with this technique the strength at the joint equals or exceeds that of the rest of the part.

Fig. 5. Part appearing in *a* previously was forged and machined in a difficult and unsatisfactory series of operations. It now is ingeniously made by stamping and flow turning in several passes as in *b*.



Advantages

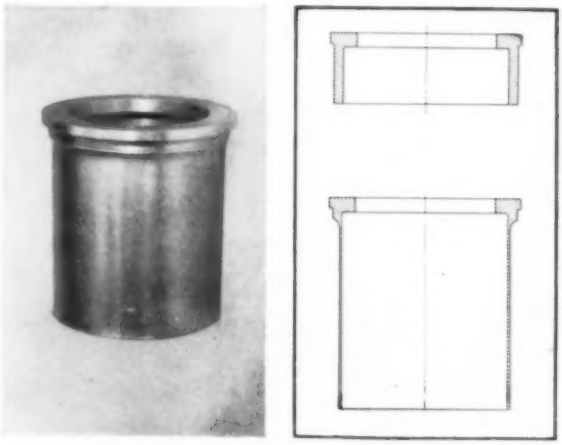
In addition to advantages cited, the flow turning process provides low-cost tooling in comparison with many forging, deep-drawing, welding or combination processes. In many instances where flow turning is indicated tooling costs will be as low as 1/10th the cost of deep-draw dies.

As referred to previously, the process also increases strength and hardness of the metal worked. There is a beneficial effect on the granular structure of the metal similar to cold rolling in contrast to stresses developed in many other types of forming. In some instances, tests have shown the flow forming process to increase tensile strength as much as 100 percent. When necessary to stress relieve, the increase was still about 40 percent. The hardness increase from cold-rolled annealed state of a metal is to between 57 and 59R due to flow forming.

Surface finish produced is excellent; in many cases it is satisfactory for the finished part. Wall thickness is more uniform than secured in deep drawing. Since wall thickness can be carefully controlled, when precision parts are desired sufficient material, 0.015 to 0.020 inch, may be left for machining. Layout of most parts and determination of blank sizes are relatively simple because of the principle that diameter of finished part equals that of the blank. This affords an economy of material.

Comparable parts generally are stronger if produced by flow turning than by other methods because the lines of grain flow within the metal remain unbroken. By combining other processes with flow turning, it is possible to produce parts impractical to make previously.

Fig. 6. Made from centrifugal casting of AMS 3551 stainless (left), part was machined with difficulty, as finished wall thickness was 0.087 inch. It was found part could be produced as short thick casting (top right) and the wall roll extruded in two passes.



Limitations

While the full range of applications of this new method are yet to be completely defined some limitations in its field are rather obvious. Generally it is confined to symmetrical, cylindrical, conical shapes, as described in *Fig.* 3. Investigations now under way at Lodge & Shipley seem to indicate a possibility of increasing this field to include elliptical and perhaps other shapes also. Again, the degree through which metal can be moved in one pass is limited. The maximum metal thickness that has been worked is ½ inch; the minimum diameter of mandrel is also ½ inch.

Considering the process is just being introduced to the metalworking industry generally, it has shown a remarkable lack of serious disadvantages within its field of application. This may be considered to be an extension or an addition to the present metalworking processes, affording a more economic means for producing many parts.

Preservation by 'Electrocution'

THINKING OF ENGINEERS concerned with corrosion may well be influenced by a project being carried on to preserve the America's mothball fleet harbored at Wilmington, N. C. Bottoms of more than 2,100 of these reserve vessels are being "electrocuted" by means of a preservative process involving electrolysis.

This cathodic protection, using metallic rectifiers involved electrodes which were submerged in the mud along the river or harbor, and connected to on-shore rectifiers. In operation, the rectifiers set up a d-c voltage between the submerged portion of the ship and the water. The resulting circuit prevents corrosion at approximately one fifth the cost of other maintenance means—according to the Maritime Administration this translates to about a $1,500 savings per ship to the government per year.

The system was devised by General Electric Co. engineers working in cooperation with the Maritime Administration.

SIMPLIFY TOOLING

and save money

By C. R. Sivits

Tool & Design Engineer
Spicer Manufacturing Div.
Dana Corp.
Toledo, Ohio

THERE ARE NUMEROUS operations in almost every factory that could be changed, simplified and performed more economically. During a period of three years, the Spicer Division has saved over $100,000 simply by changing the sequence of operations of various jobs, standardizing and simplifying tooling, and synchronizing tooling with production requirements.

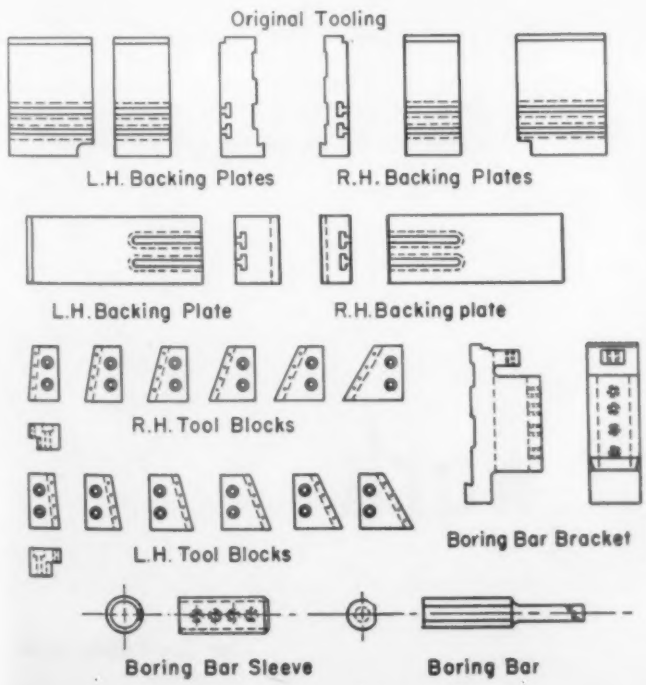
As an example, changes in tooling for the machining of twelve gears of similar design will be described. The original tooling was used on an eight-station vertical spindle machine to drill, turn, face, bore and ream the gears. This tooling consisted of six designs of backing plates, three right and three left; twelve designs of tool blocks, six right and six left; two drill brackets; two boring bar brackets, and one reamer bracket. Revised tooling for machining the same gears on the same machine comprises: two backing plates, one right and one left; two drill brackets; one reamer bracket, and one tool block.

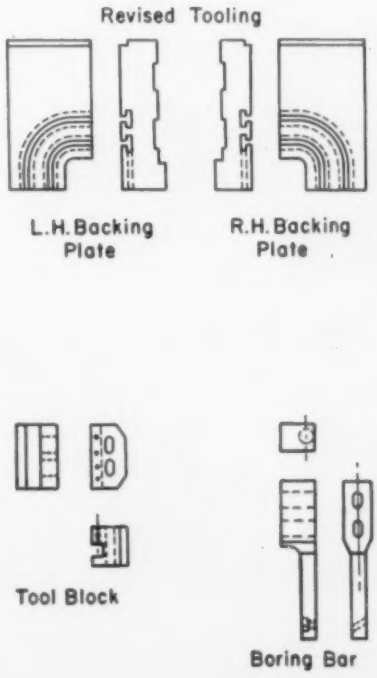
Disadvantage of the original tooling was in the removing, matching and replacing of backing plates, tool blocks and tool bits. The backing plates had either vertical or horizontal T-slots for attaching tool blocks and adjustment was limited to one direction. The tool blocks were made with an angular slot to correspond with the cutting angle of the tool bit.

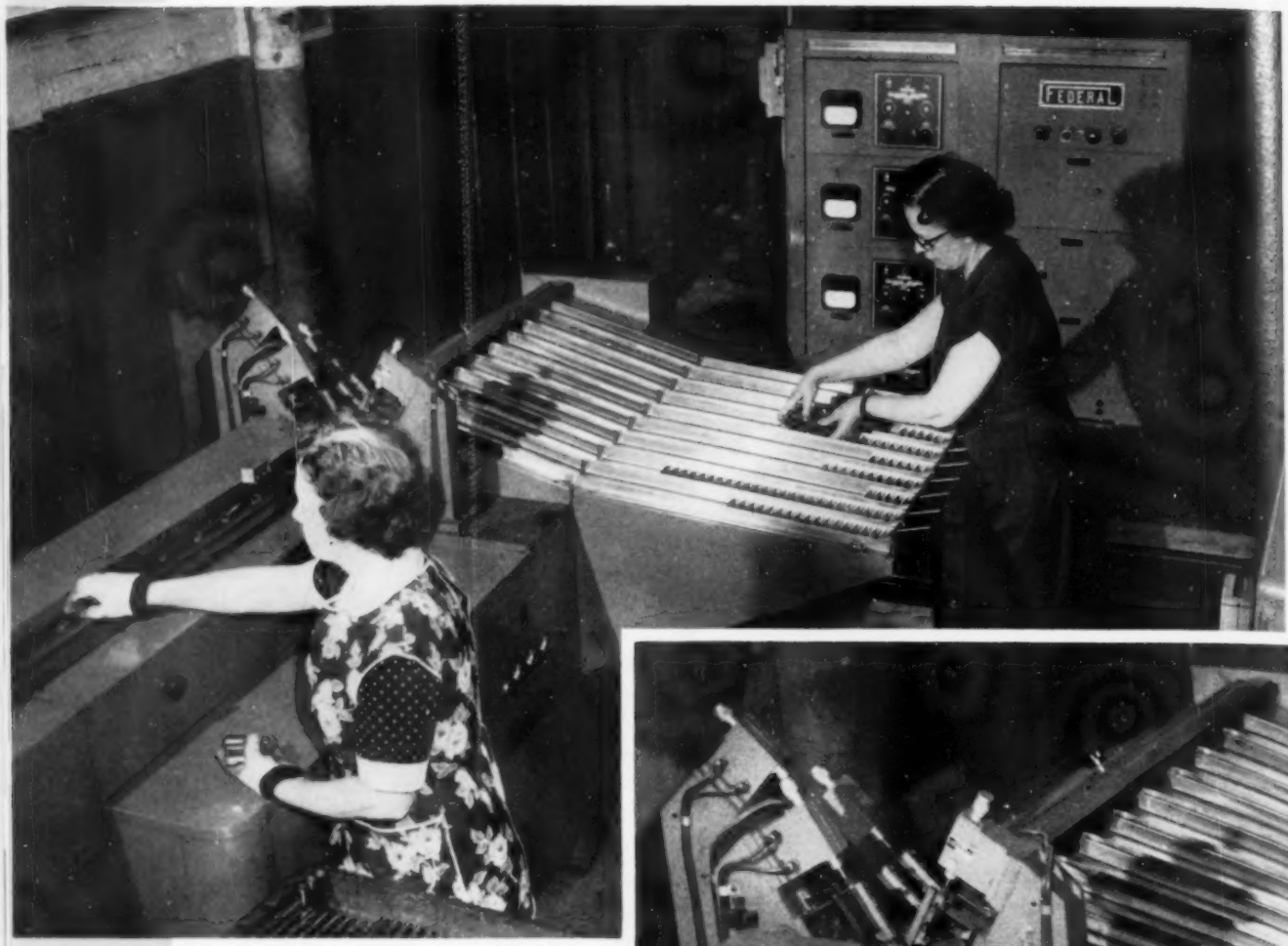
In the revised setup, the tooling is simple and its application is easy. The plates, blocks and bits do not have to be matched or removed from the machine for adjustment. The backing plates have radial T-slots so the tool block can be mounted at any angle. This angular adjustment makes possible the use of tool bits with removable carbide inserts. The boring bar is attached to the backing plate in the same way as the tool block.

Individual designs of gears are produced in small quantities so that frequent setup changes are necessary. The standardized and simplified tooling has resulted in increased production per employee, reduced setup time, decreased tool maintenance and reduced production costs.

By carefully examining the requirements for producing twelve similar designs of gears, tooling was reduced and simplified, and production costs went down.

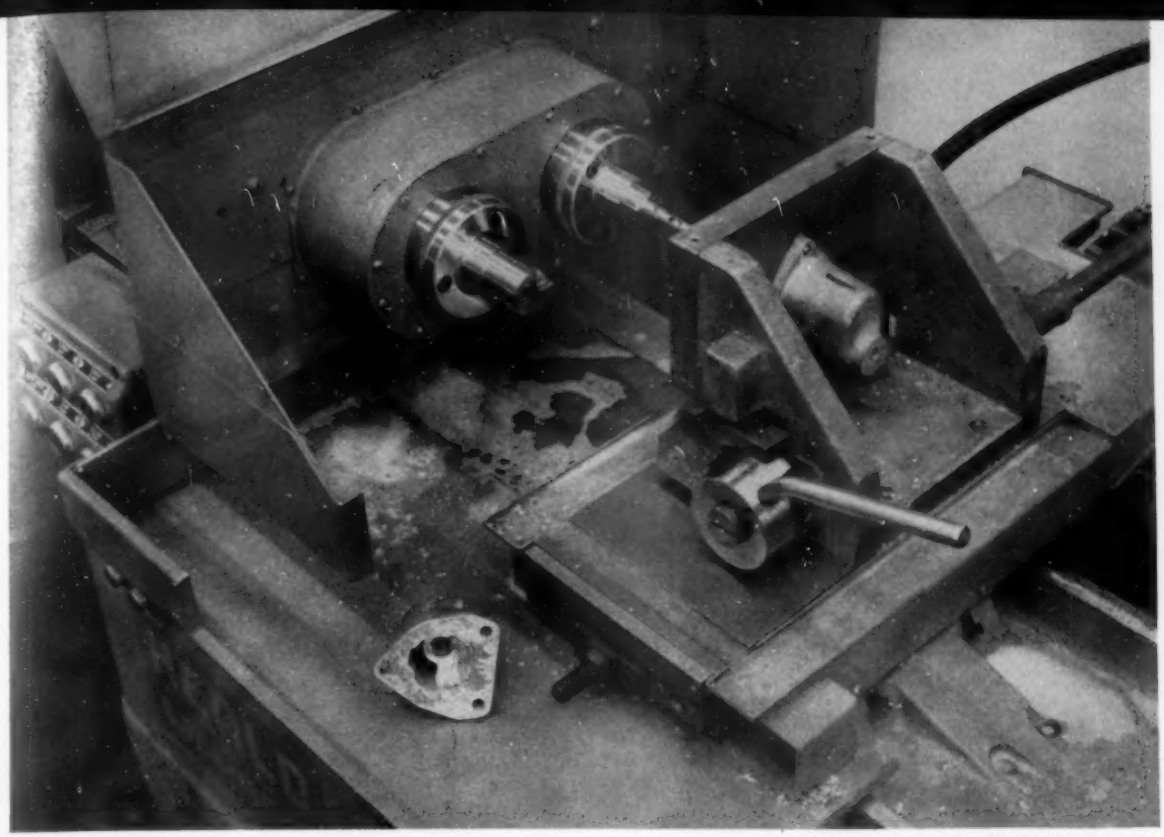






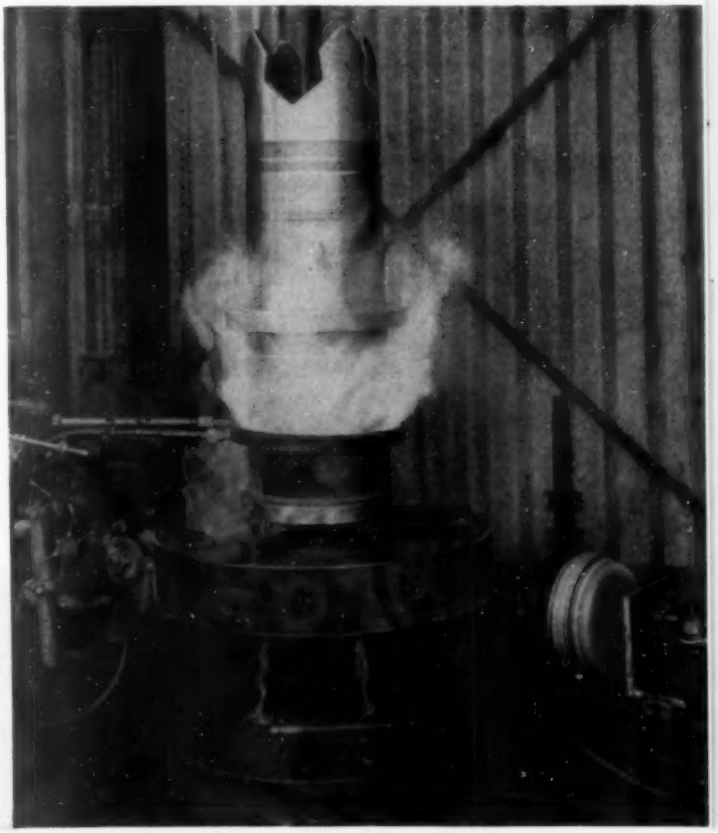
AUTOMATIC inspection and gaging of piston pins is performed electronically at Dodge plant of Chrysler Corp. (Inset) The pins are first checked for hardness and thrown out immediately if outside the prescribed range. Other parts of the gaging head then gage for roundness (to 0.00005 in.), diameter and taper (to 0.00001 in.). The gaging unit sends impulses to the memory unit at right for sorting the pins into five good groups by size graduations. Other disposal chutes are for oversize, undersize, out-of-round or too much taper.

TOOLS at work



—Photo courtesy The Heald Machine Co.

INDEXING ANGLE plate fixture on cross slide mechanizes boring operations on oil pump inlet cup. On the front station the large diameter is bored in an interrupted cut shown in finished part (bottom left). Also, the bottom face of this diameter hole is plunge cut in the same station. On the rear position the smaller diameter is bored, chamfered and bottom face plunged. Bores are on different centerlines with spacing tolerance of 0.0004 and bore tolerances of 0.0005 inch.



AUTOMATIC flame hardening of an oil-well drilling sleeve is performed in a specially developed hydraulic unit at Columbia Industries, Huntington Park, Calif. The base on which the part is chucked rotates at 220 rpm as the oxyacetylene and water quenching head moves vertically for progressive sectional hardening. The process is closely controlled by adjusting the heat, water quench and feed.

PREVENTING PRESS FAILURES

overload relief

By A. F. Gagne, Jr.*

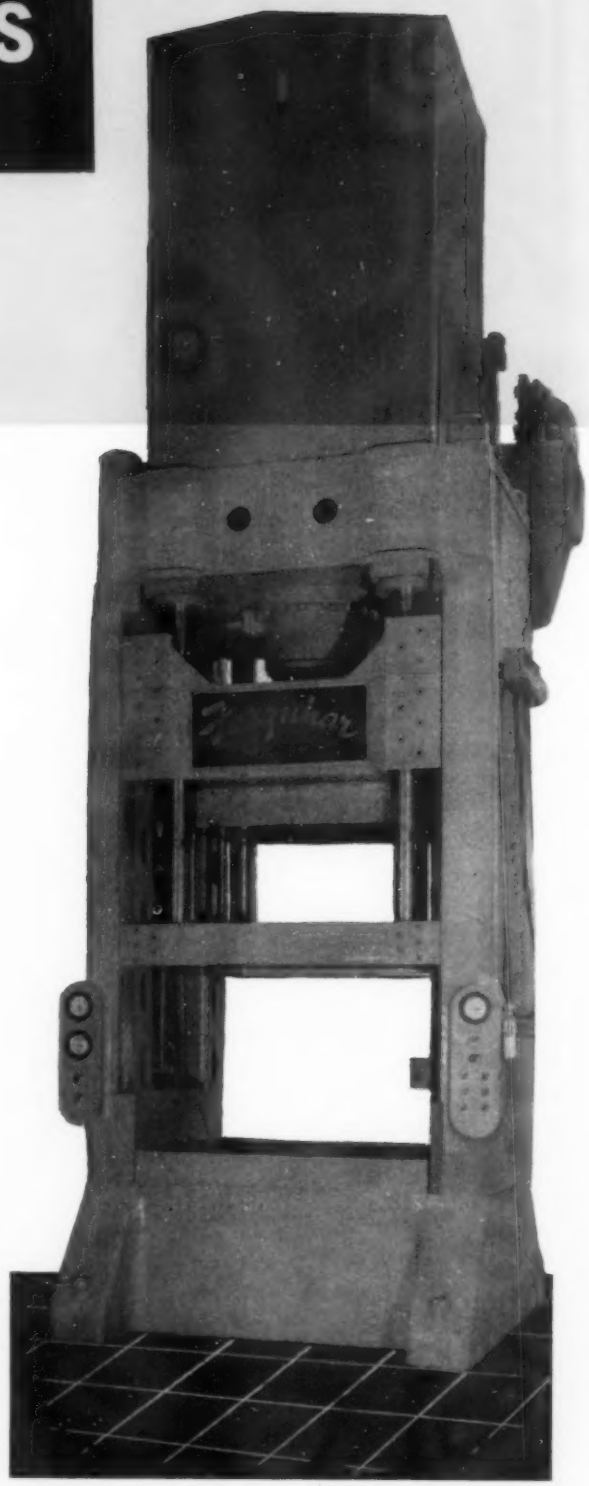
Consulting Engineer
Binghamton, N. Y.

POWER PRESS SMASHUPS sometimes occur during hit-home operations such as coining, sizing and flattening. These processes are vulnerable because they are dependent on uniform stock thickness and accurate ram adjustments during die setting. None of the various devices designed for preventing press smashups gives protection against all eventualities. Automatic tonnage limiters for presses can prevent damage that would result from carelessly lowered rams or oversized stock. Hydraulic presses, *Fig.* 1, offer one means of limiting tonnage.

Advantages of Hydraulic Press

Modern hydraulic presses are rigid, compact, self-contained machines that can operate at high cycle speeds. Other advantages are:

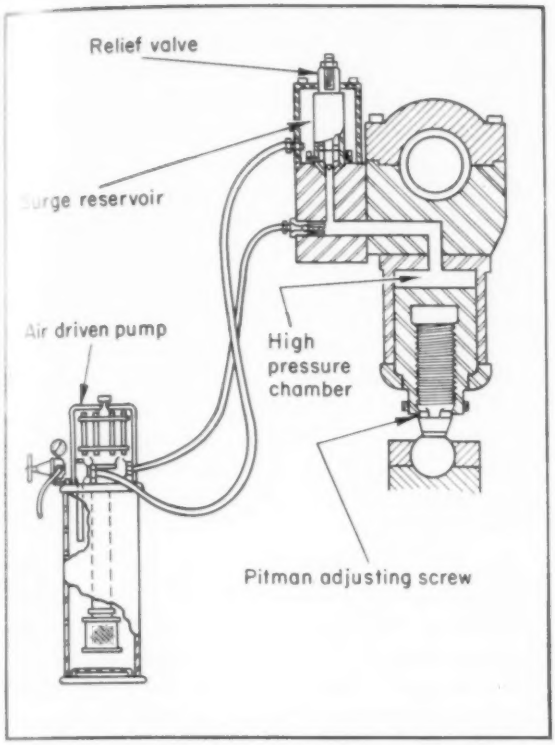
1. Tonnage is controllable at all times and at all ram positions. Heavy presses can be used on light jobs without die or part damage.
2. In drawing operations, the conventional crank press contacts the work at high speed. Speed gradually reduces as the crank goes from midstroke to bottom center. Beaver tails and other special mechanical cam compensators, intended to give a more suitable speed characteristic, cannot be readily varied for



—Photo courtesy A. B. Farquhar Co.

Fig. 1. Double acting, 450-ton hydraulic press. After optimum die tonnage is established, die life can be prolonged by resetting tonnage each time the die is used.

***Senior member ASTE Binghamton chapter.**



—*Drawing courtesy Dayton Rogers Mfg. Co.*

Fig. 2. Hydraulic pitman load control prevents overloading press or tools.

different operations. For drawing jobs on hydraulic presses, rams can be rapidly lowered to the blank, slowed momentarily, then driven down at a constant or rising speed near the maximum safe value for the work. A fast bumping finish and quick ram return can be provided when the work is to be set or ironed. Such flexibility often makes possible higher cycle speeds than permissible with crank presses.

3. Smooth action is helpful for deep draws exceeding five or six inches. Steel of poor drawing quality and below specification can often be worked with substantial savings in metal costs and scrap losses.
4. Savings also result for short-run, job-shop press work because daylight can be varied as needed. Die setting is speeded because shut height is not fixed and die shimming is not necessary. This facilitates frequent change-over.
5. Short repeat strokes can be exerted upon the work as a part of each cycle. This vibratory action eliminates trapped air and is said to improve detail on coined or embossed parts. It is also useful for compacting operations such as powder metallurgy and pelleting.

Air and air-hydraulic presses are closely related to the oil-hydraulic type. For loads under 10 tons these are relatively inexpensive, economical to operate, and easily protected with interlocks and other safeguards for hand feeding.

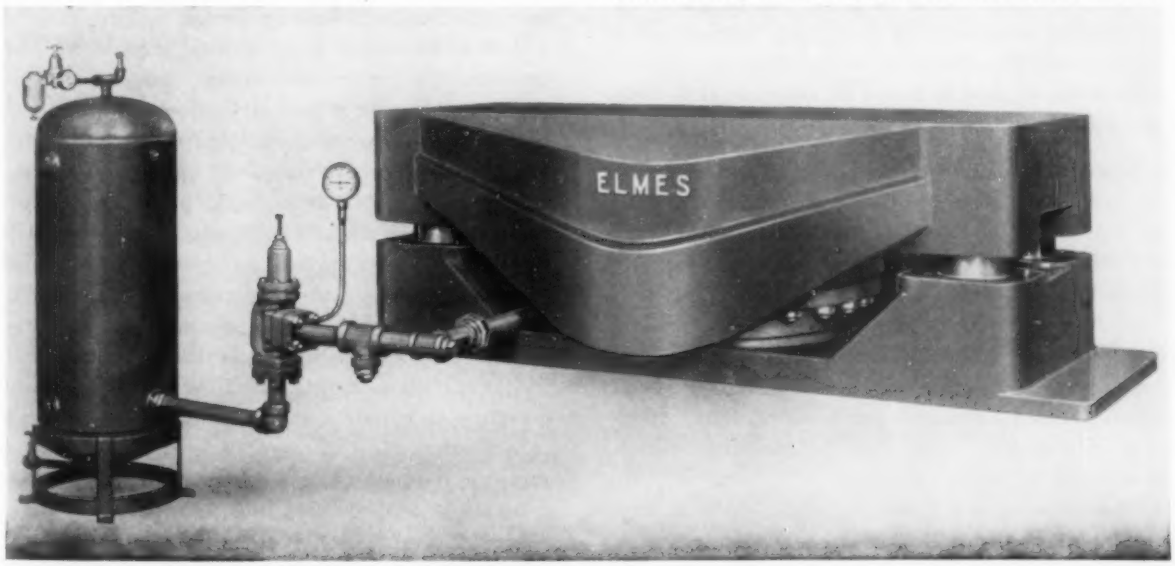
Disadvantages: With a capacity below 200 or 300 tons, the hydraulic press costs more than a mechanical press of equivalent capacity. The special maintenance required and the possibility of oil leaks are other drawbacks. Certain high-speed mechanical blanking presses can operate faster than the latest hydraulic presses.

Protecting Mechanical Presses

Hydraulic Pitman Load Control: There are several ways of providing mechanical presses with load-limit control similar to that inherent in hydraulic presses. One direct method is to modify the pitman by adding a preloaded cylinder, *Fig.* 2. This device contains a calibrated hydraulic relief valve for setting the desired working tonnage. The die is installed and the ram adjusted in the usual manner by a pitman adjusting screw. If a double-header occurs or if the stock runs over-gage, the

Fig. 3. Hydro-pneumatic press cushion compensates for overloads built up by blank-thickness variations, metal strain-hardening or heat conditions.

—*Photo courtesy Elmes Engr., Div. American Steel Foundries*



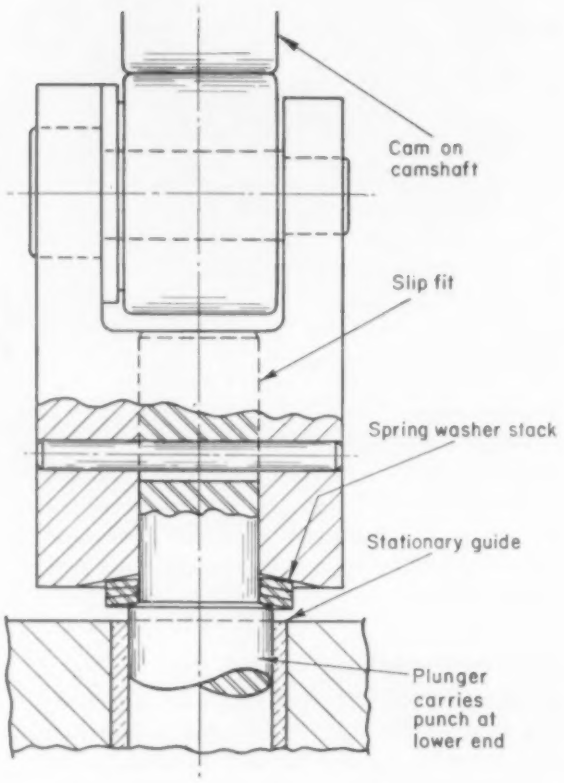


Fig. 4. Spring overload protection devised to limit loads on a relatively slender coining punch.

relief valve opens. Oil then escapes from the high pressure chamber into the surge reservoir and allows the pitman to shorten by as much as ¾ inch. Oil in the reservoir returns by gravity to an air-driven pump that automatically pumps up the high pressure to reset the pitman when the ram rises. A limit switch can be used to sound an alarm or shut down the press in the event of overload.

Die Cushion Overload Relief: Load-limit control can also be secured with a suitably designed die cushion. Ordinary pneumatic die cushions are not satisfactory for overload relief because they are designed specifically for blank holding and their capacities are only from 1/6 to ¼ of press capacity. Since pressure is usually limited to that of the shop air supply, the solution might be to increase cushion area sufficiently to match the press capacity. However, it is usually found that the resulting cushion is too large to fit the press bed.

One solution is a hydropneumatic cushion, *Fig.* 3, placed on the press bed plate. Such cushions permit internal pressures as high as ten times (1000 psi) those available in straight pneumatic cushions. The cushion shown can be adjusted to cushion total loads from 0 to 1000 tons, its rated capacity, and the capacity of the press.

When tool jams produce force against the surface of the cushion exceeding the setting of the adjustable relief valve, liquid is forced back through the valve into the storage tank. After the press ram ascends, air pressure acting on the surface of the liquid in the tank returns the liquid through a check valve to the main cylinder, raising the cushion working surface to its original position. If desired, a locking device is supplied to relay the return stroke. Two-step pressures can be provided if required; a light load for blank holding, and a heavier load for overload protection.

Spring Loading: Where applicable, spring loading of punches or complete die sets provides a simple and inexpensive load limit. Usually the spring is preloaded, so that movement occurs only when the initial load adjustment is exceeded. This practice tends to avoid spring fatigue and minimize wear on the guiding members.

Most springs require more space than hydraulic cylinders of equivalent capacity. Up to 18 inches of spring height is needed for 1 inch of travel. Another difficulty is that spring loaded increases with deflection. Both objections can usually be overcome by providing sufficient space in the original design.

Standard die-maker compression springs are limited to 2000 lb maximum capacity, or approximately 1500 lb preload. This might be adequate for spring-loading an individual punch, but would be too light for most purposes. Capacities of several tons can be obtained by nesting springs or by using leverage. Exceptionally heavy loads can be carried on railroad-type springs. These are made in capacities to 30 tons by several concerns.

Belleville washer type springs provide effective overload protection when space and capacity are problems. However, load deflections of 0.100 inch or less must be acceptable. Stock dies are available to produce springs in sizes from ⅞ inch OD, giving capacities from 400 to 30,000 lb per washer. Eight washers can be stacked for a total capacity of 120 tons. Shown in *Fig.* 4 is an installation in which flat washer springs are used rather than Belleville-type springs. Flat washer springs are easier to manufacture, but deflection is more limited. The 2 3/16-inch diam spring stack is preloaded by a cross pin to supply a minimum 3,000-lb resistance to deflection. In the event of a double-header or scrap on the die, the punch is protected by a maximum stack yield of 0.015 inch.

Liquid compression springs have large load ca-

pacity and stroke for the space they occupy. Wales-Strippit Corp. has introduced this type for stripper work. As a result, space requirements have been cut to 1/6 that required for helical springs. Spring force is adjusted by turning a mechanical vernier knob.

Air springs are useful if their diameter is not restricted. Fatigue is not possible and stroke is very long for space used. There is no load build-up and air consumption is small where the spring floats on the air line. These advantages have led to frequent air spring use, especially in conjunction with leverage. If load increases beyond the air cylinder adjustment, *Fig.* 5, the upper link pivots out on the wrist pin and shortens the distance between top and bottom, relieving overload.

Rather than protecting the punch or ram connections, the press frame itself can sometimes be spring-loaded. Straight-side presses often use a four-piece tie-rod construction. The crown, both columns, and bed are compression members held together by four steel tie rods. If the crown is guided to travel vertically, tie rods can be loaded by railroad-type compression springs to achieve built-in overload relief. This method replaces shrinking the tie rods in place.

Load-Limiting Clutches: Several press manufacturers have installed shear pins in the clutch between flywheel and crankshaft. Pins protect press parts, but a sudden overload might wreck a lightly built die set. Although inexpensive, shear pins are troublesome to replace and tend to shear progressively or fatigue if loaded near their ultimate shear strength.

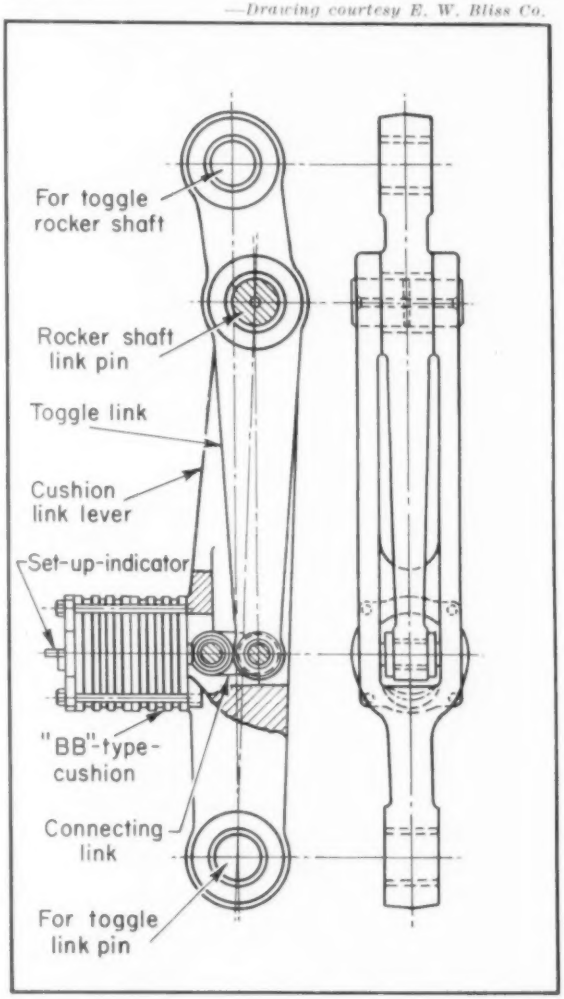
Slip clutches effectively limit clutch loads. A manufacturer of hot bolt headers and forging machines uses a friction clamp connection between flywheel and crankshaft to absorb shock of momentary overloads and to prevent damage if the machine should stall on cold stock.

Pneumatic clutch-brakes, *Fig.* 6, combine slip clutch and disconnect clutch action in one unit. A quick release valve provided at each connection of air inlet to rubber air cell speeds disengaging. An integral spring-powered brake is released by an air cylinder. Advantages of the pneumatic clutch-brake for light or heavy press work are:

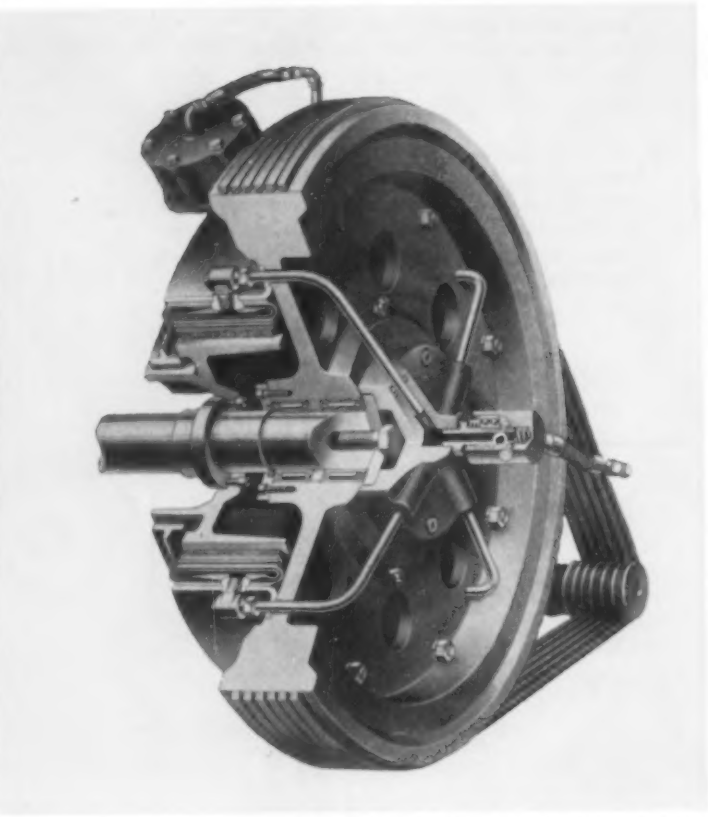
1. Clutch torque can be adjusted for each job by twisting a knob. Because it is not seriously affected by repeated slippage, clutch can be set close to actual load requirement to cushion running shocks.
2. Air pressure setting serves as a press load indicator.
3. Time is not lost waiting for the key or pin to come around because the clutch engages almost instantly. Smooth and shockless engagement lowers maintenance costs for clutch and drive.
4. The ram will not drop while the press is being power inched during setting of the die.
5. Press can be stopped immediately at any point in the stroke, adding to the safety of such features as trouble detector switches and photoelectric safeguards.
6. Two-hand pushbutton control can be provided at any location on the press for the safety of one or more operators. Press stops when any pushbutton is released.
7. Clutch and brake are mechanically interlocked, preventing continuous rubbing of brake.

Fig. 5. Load-limiting toggle link for both single and double crank drawing presses. Four identical links make a set.

—Drawing courtesy E. W. Bliss Co.



Although air clutches protect presses under most circumstances, dies may be unprotected. Chipping or breaking of slender punches might not produce appreciable overload on an over-all basis. When the crank is at bottom dead center it has the mechanical advantage of a toggle. Torque on the crankshaft may be low but the die can be seriously damaged. Fortunately, a jam is more apt to occur in the range from 90 to 10 deg above bottom center. Bottom dead-center jams or local overloads are best



—*Photo courtesy Sales Service Machine Tool Co.*

Fig. 6. Pneumatic clutch provides sensitive and adjustable overload protection and convenient start-stop control. Design uses an inflatable rubber tube which contracts the clutch lining around the drum. Air cylinder is shown at top left.

controlled by detectors or by spring loading.

In some designs the clutch drives a heavy bull gear keyed to the crankshaft. If a jam should occur near bottom dead center, the bull gear itself could have enough kinetic energy to smash the die or break the press frame. The safety slip action of the clutch would be largely wasted. Therefore, for maximum benefit, the air clutch must be installed between the crankshaft and the bull gear or flywheel.

This is the fourth in a series of articles concerning prevention of power press smashups. The final article will discuss press maintenance and operation.

Acknowledgments

Appreciation is extended to the following companies for supplying information for this article:

Blackhawk Mfg. Co.....Milwaukee 1, Wis.
Clearing Machine Corp.....Chicago 38, Ill.
Cleveland Punch & Shear Works.....Cleveland 14, Ohio
The Denison Engineering Co.....Columbus 16, Ohio
Dynamatic Corp.....Kenosha, Wis.
Federal Machine & Welder Co.....Warren, Ohio
Hydropress, Inc.....New York 1, N. Y.
Thomson-National Press Co., Inc.....Franklin, Mass.
K. R. Wilson & D. F. Lindgren.....Buffalo 3, N. Y.

Radiant Heat for Shrink Fits

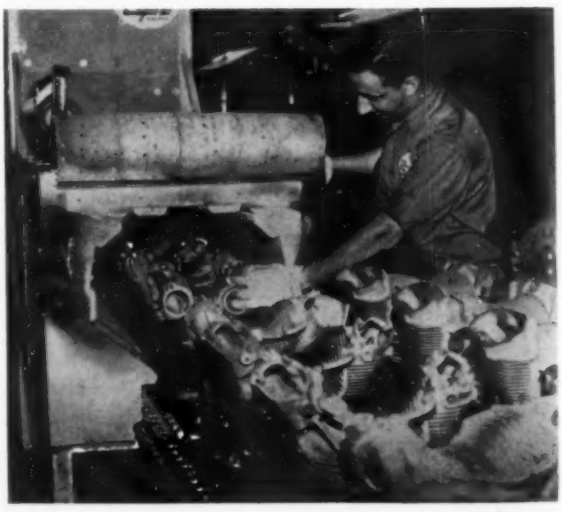
NECESSITY of faultless fitting engine parts is universally acknowledged in industry. For the precision job, shrink fit is widely used, as it is at Capital Airlines at Washington National Airport. Here, however, experiment has led to the use of far-infrared radiant heat for precise preheating of engine cylinders on a conveyorized basis.

This heating brings with it several advantages: it has caused increases in assembly production of 30 percent; a saving of 25 man hours per week.

In the operation, a flexible radiant tunnel is used which not only has infinitely variable control, but may be adapted to handle the various types of cylinders for engines to be overhauled. Six electric radiant heaters, rated at 3.6 kilowatts each, enclosed in an insulated shell and mounted on structural framing over the conveyor line, make up the tunnel. Heaters concentrate radiant heat on the valve opening areas on each cylinder while radiant effectiveness is incresed through reflective aluminum spacers between the heaters.

The tunnel accommodates six cylinders at a time continuously. Correct temperatures for each type of cylinder are obtained by varying the setting of a percentage-type input controller. Maximum setting in any case is 75 percent. Additional control is provided by a nonindicating regulator which limits ambient temperature at 650 F.

Operator adjusts cylinders on conveyor at entrance to far infrared tunnel.



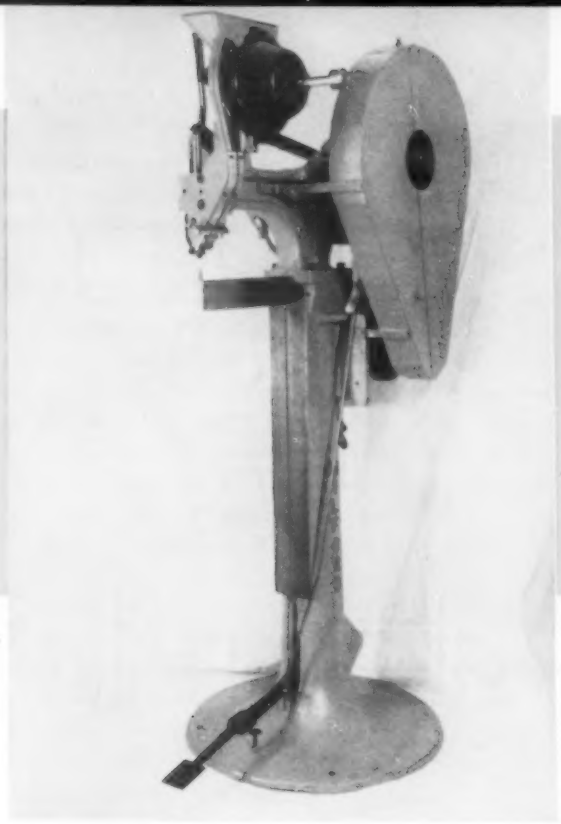


Fig. 1. Typical high-speed automatic hopper-fed rivet-setting machine is becoming an important production tool.

RIVETS

cold-formed parts for reduced costs

By V. L. Bradford

Vice President
Milford Rivet & Machine Co.
Milford, Conn.

THE RIVET, as a unit, may cost only a fraction of a cent, but intelligent use of that rivet can mean the saving of thousands of dollars in a single year. Rivets and automatic rivet-setting machines, *Fig.* 1, can be used in the assembly of small parts in almost unlimited applications. Historically, the principle of the rivet is second in age only to the peg or crude nail. Today, the rivet and its many uses are being rediscovered. Modern design uses the rivet not only as an inexpensive fastener but assigns to it functional action, such as in pivots, cams and electrical contacts.

Rivet Types

There are five major types of rivets used now. These are: semitubular, *Fig.* 2, full tubular, split or bifurcated, compression set and special cold-formed types. They are produced from wire stock on cold-heading machines and have low unit cost, minimum material waste and high strength.

The semitubular rivet has a tapered internal hole and is used for fastening plastic, wood or metal parts in which rivet holes have been prepunched. This type of tubular rivet is used when the full shear strength of the shank is required. The full tubular rivet is best suited for fastening soft materials, such as leather, canvas, heavy cardboard and wood, where the rivet must form its own hole. The deep internal hole allows room for the slug of material inside the rivet.

Bifurcated rivets are used for light fastening jobs. The relative sizes of the two parts of a compression set are such that they produce a tight press fit. Rivets of this type are ideally suited for use in the production of cutlery, for example, where it is important that both sides of the fastener look alike and fit into counterbored holes.

Special cold-formed parts have no definite form or shape. Each is designed to satisfy a special requirement. Such parts are cold-headed but usually undergo additional operations, such as threading, knurling, turning, grooving or slotting. These parts are being used increasingly and usually serve as a

Abstracted from paper 22T16, "Fastening Techniques for Small Assemblies," presented at the 22nd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

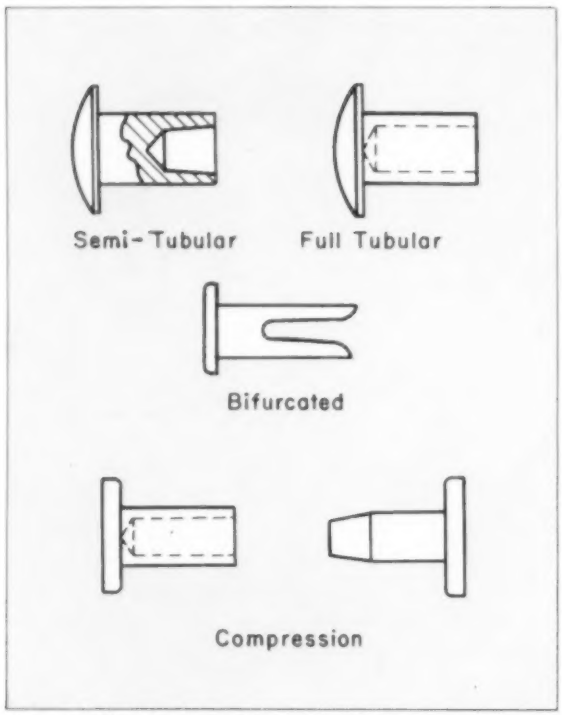


Fig. 2. The four standard rivet forms.

functioning part as well as a fastener. They offer advantages of low unit cost and high strength when compared with cut or turned parts.

Design with Rivets

There are no rules that apply to the use of rivets as fasteners. Each assembly presents its own size limitations and therefore its own design problems. The easiest way to prevent production problems is to design an assembly for fastening with rivets from the start and to select the correct rivet. It is frequently advisable to consult a rivet manufacturer.

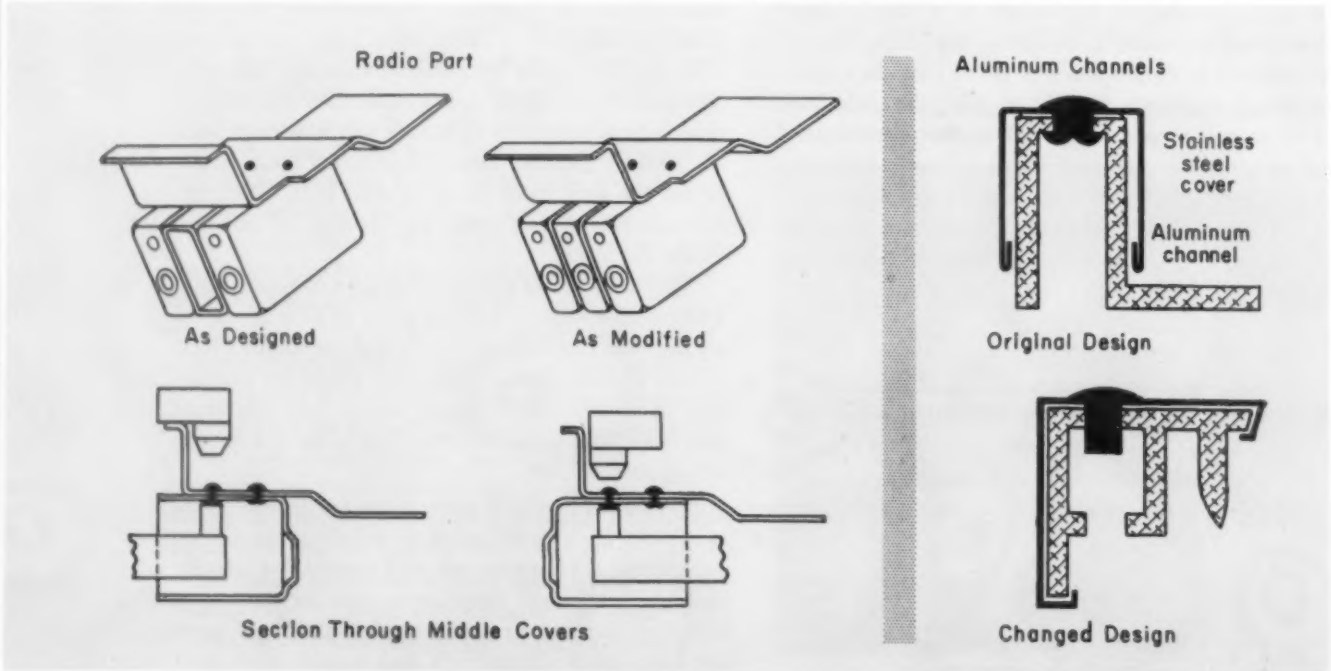
Regardless of the rivet used, the ultimate success or failure of any application depends almost entirely on the design of the assembly in which the rivet will be used. If maximum production efficiency is desired, the fastener should be put into place automatically by a high-speed riveting machine. The assembly must be designed so the riveting machine can do its job of aligning the work, feeding the rivet, placing it and roll setting or clinching.

Influence of Machine on Design: The basic design requirements are not too difficult to meet. It is simply necessary to allow sufficient working room for the head and arm of the machine within the confines and structure of the assembly. The machine jaws must be able to present the rivet over the work and be able to open to free it. The amount of space required for this is dependent on the size of the rivet, which determines the size of the jaws needed.

The closed dimension of jaws on a typical machine designed for setting $\frac{1}{8}$-inch diameter rivets is 0.718 inch. To release the rivet, the jaws must open to 0.859 inch. Jaw dimensions for a $\frac{1}{4}$-inch rivet are: closed, 0.718 inch; open, 1.025 inch.

Errors in Design: Changes in design frequently improve the ease with which parts can be riveted but sometimes make riveting impossible. The radio part, *Fig.* 3, as it was originally designed, was a

Fig. 3. Changes in assembly design can increase (left) or decrease the ease of riveting.



assembly for riveting. The jaws did not sup- the rivet in the middle cover and the part had e turned end-for-end to complete assembly. By ifying the part so all covers face the same way, per support is obtained and all rivets can be set n the same end.

The original design for installing stainless steel ers on aluminum channels, *Fig.* 3, was satisfac- y because a modified roll set could enter the annel to set the rivet. The design was changed for tructural reasons but with the new design, the rivet ould not be set.

Frequently a riveted assembly can be made prac- ical by reversing the application direction of the rivet. In *Fig.* 4, top left, the design specifies an external clinch on the rivet. The channel section is too narrow to allow the riveting machine jaws to open and release the rivet. By reversing the rivet direction, this assembly is easily riveted. The jaws are clear and a modified roll set can enter the channel. The right-hand portion of *Fig.* 4 shows rivet placement, at the top, that will not work. Riveting tools cannot approach this close to the corner of the box lid. By moving the rivet location out of the corner, assembly by rivets is easy.

Rivet placement in electric lamp sockets, *Fig.* 5, is the source of a common design error. Such an assembly problem occurs after the design has been frozen. After production starts, the manufacturer wants to change to riveting to reduce costs. The left-hand hole is almost covered by the molded thread of the socket shell. Without a design change to shift this hole toward the center, the rivet could not be machine set.

Premature Freezing of Design: If the designer has any doubts about the practicability of a riveted design, he should fight premature freezing of the design. A slight modification of the design can often mean large production savings. In many instances, manufacturers have wanted to use rivets to reduce costs but could not because the design was frozen by the purchase or production of parts.

A six-bladed fan assembly, *Fig.* 6, illustrates an actual production problem. At first glance it appears to be a simple job for an automatic rivet-setting machine. There are six blades with six well-spaced rivets in each. This job was not simple, it was impossible! Putting the first five blades in place pre-

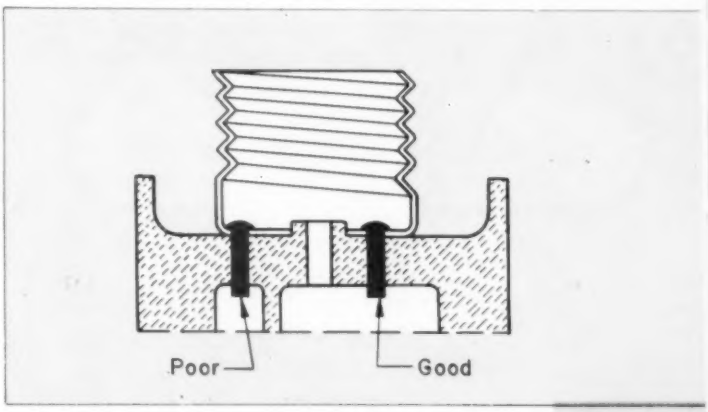
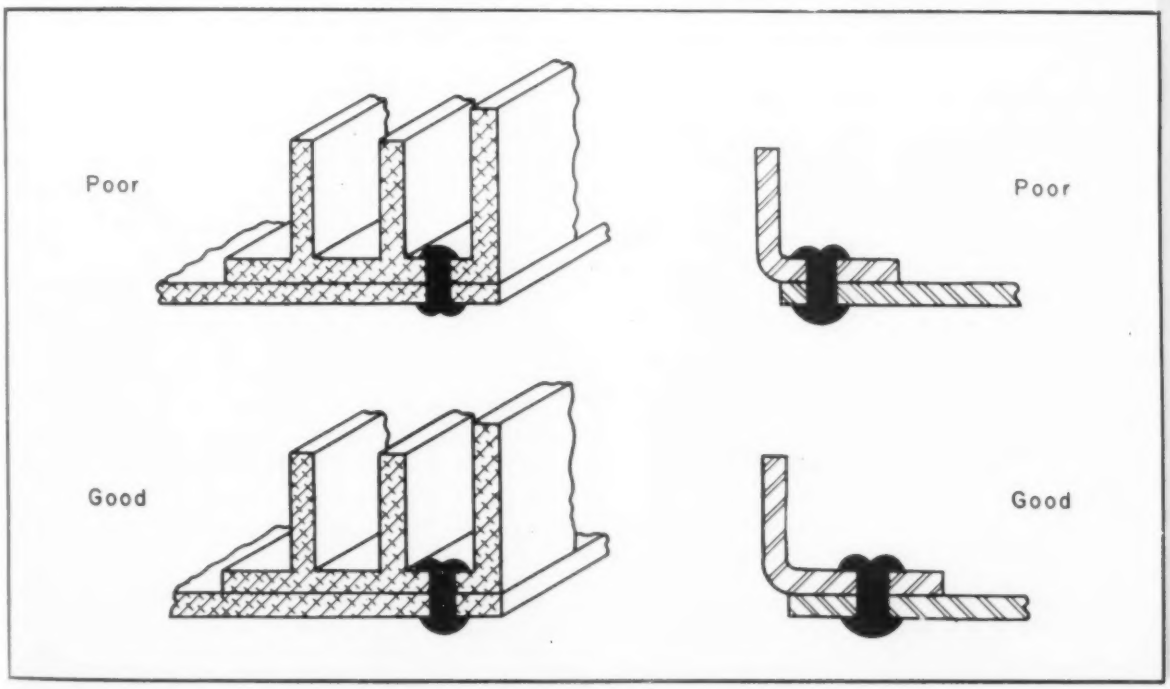


Fig. 4. (below) Changing direction of rivet insertion or moving rivet location can frequently solve production problems.

Fig. 5 (right) Unless modified for use of rivets, this lamp socket assembly cannot be fastened by an automatic machine.



sented no problems because there was sufficient maneuvering room. When those five were in place, however, it was impossible to place or set the last rivet in the sixth blade. The other blades completely blocked the hole.

A slight change in the method of assembly could have saved the job for riveting. By riveting the blade supports to the individual blades and then riveting the supports to the hub, the job could have been done handily. However, the supports had already been riveted to the hubs and the plan for machine-set rivets had to be abandoned.

Cold-Formed Parts

Cold-formed parts, or special rivets, are usually produced at a fraction of the cost of the same parts if made on conventional automatic turning machines. This is true because the parts are cold-formed from wire stock without waste. Scrap, even though sometimes reclaimable, means increased costs. Because waste is avoided, cold-formed parts can frequently be made at an over-all cost that is equalled by the raw material costs of producing the parts by machining.

A small brass plunger, for example, would require stock costing $45 per thousand if produced on an automatic screw machine. Produced by cold-forming, this same part is made for $48 per thousand—including material, labor and profit for the producer.

Until recently, a large manufacturer of fluorescent lighting fixtures used a two-part fastener, *Fig.* 7, consisting of a tapped and grooved steel part produced on a screw machine and a slotted round-head machine screw. This fastener was installed by hand. After redesigning the fastener, the company now uses a single cold-formed part that is positioned by a high-speed hopper-fed riveting machine that automatically stakes the shoulder of the part against the inside of the fixture housing.

The new assembly method not only saves about 2c on the cost of each part but production in placing and fastening them has been raised about 400 percent. On this one small item, the company is realizing an over-all saving of close to $10,000 per year.

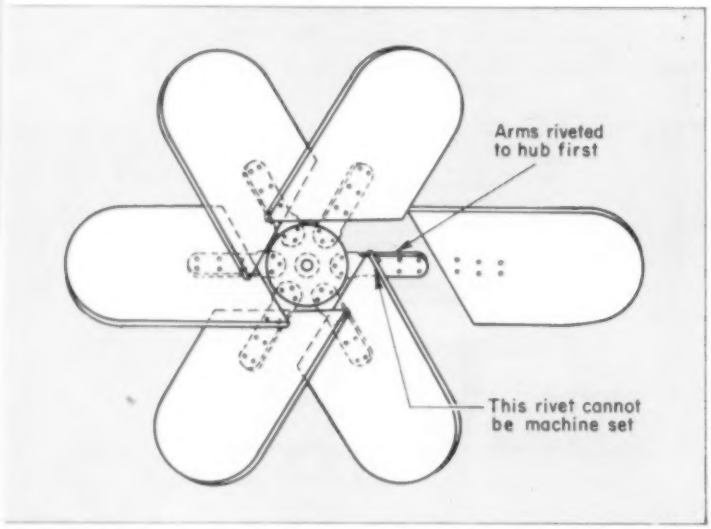
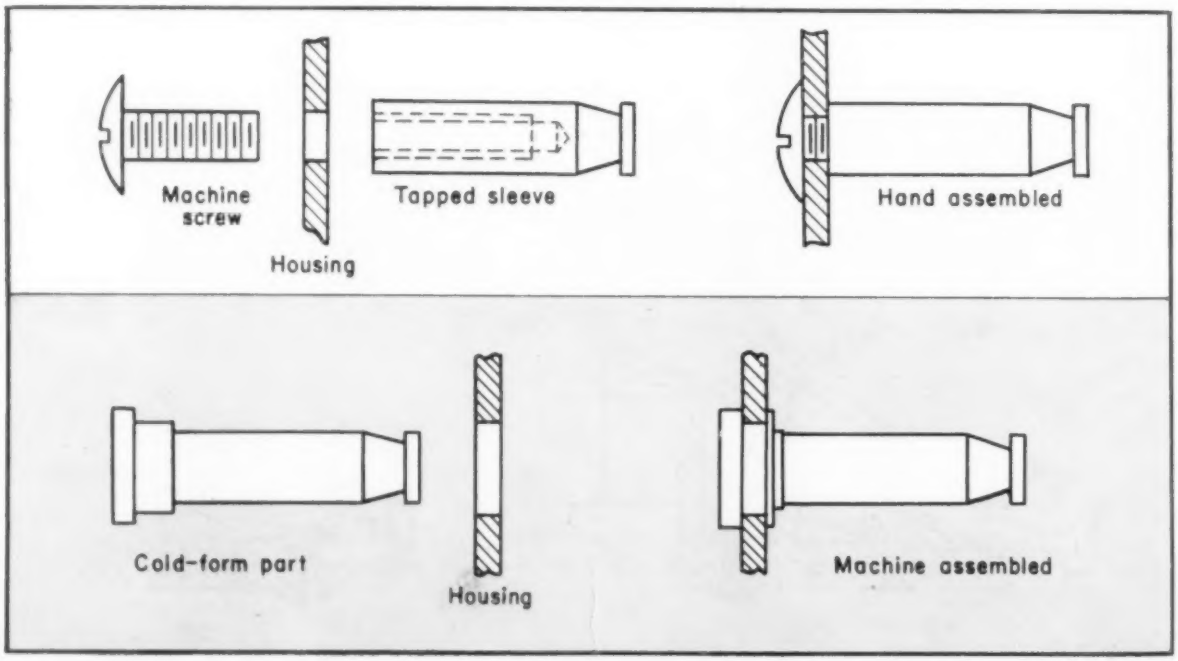


Fig. 6 (left) This apparently simple riveting job was impossible because the assembly method was frozen too soon.

Fig. 7. (below) The single cold-formed part at the bottom reduced material and labor costs over the formerly used two-part fastener.



JOINING thin walled parts by deforming with rubber

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MECHANICALLY JOINING thin-walled tubular sections to each other and to heavier sections is often difficult because of their tendency to crush under pressure. Rubber clamping is a method for permanently deforming metal tubing to produce structurally sound and liquid tight joints. If properly supported, rubber can transmit pressures of 30,000 psi, which are sufficient to distort shapes of certain types of steel, brass and other metals.

Procedure

To use rubber clamping, a heavy fixture is designed to enclose a rubber ring that will impart the desired deformation to the thin-walled part at the correct position. The fixture restrains the rubber, *Fig.* 1, except at the metal surface to be deformed. When the loading ram exerts pressure on the rubber ring, action of the rubber is similar to that of hydraulic fluids. Restrained from movement in all directions but one by the clamping support, the rubber is displaced inward and permanently deforms the thin metal wall. Since the pressure on the rubber is evenly distributed around the entire circumference, a joint of uniform tightness and shape results.

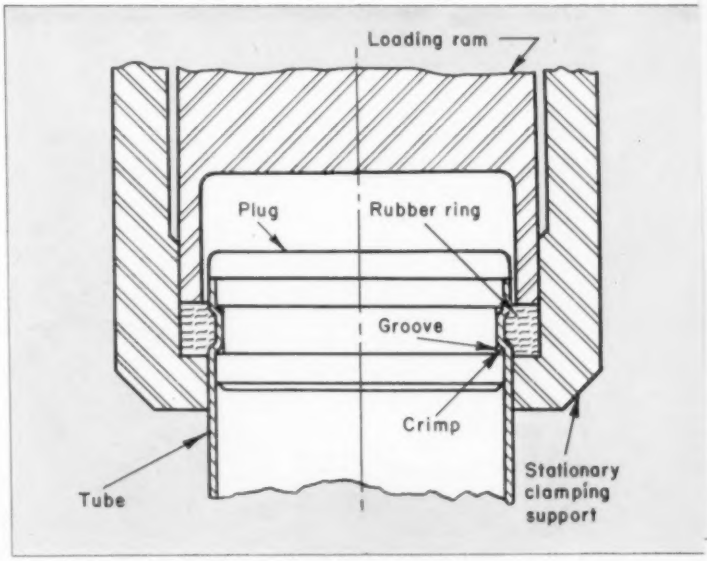
To permanently attach a sealing plug in the end of a thin-walled tube, as shown, it must have a groove on its periphery into which the walls of the tube can be deformed. When the two parts to be joined are of light construction, auxiliary internal support must be included in the tooling.

If the thin-walled section is to be expanded, tooling must be designed to work from the inside, *Fig.* 2. The part to which the tube will be joined supports the tube around the forming groove, but the rubber ring needs additional support. This is obtained through use of a mandrel that is stationary during the forming process and prevents downward displacement of the rubber. Since the rubber returns to its initial shape when the ram is withdrawn, the mandrel and rubber ring can be easily removed from the assembled part.

Tooling

A horizontal press is usually used for clamping

Fig. 1. One application of external rubber clamping.



Abstracted from paper 22T2, "Joining of Thin-Walled Parts by Rubbing-Clamping," presented at the 22nd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

large parts together. For small parts, a vertical press can be used effectively with gravity loading and unloading.

Rubber Ring: The rubber used for clamping rings must be hard enough to resist extrusion into clearance spaces under high pressure and flexible enough to flow where required. It must have high fatigue endurance to avoid cracking under repeated compression. Good results have been obtained by using commercial neoprene made to Specification SC-718, ASTM, D-735-48T. Shore hardness should be about 70 and the tensile strength 13,000 psi or more.

Formulations of rubber forming rings should be varied to provide properties most suitable to the metal being deformed. Metals having high yield points require a forming member with less ductility and greater resistance to plastic flow than those with a low yield point.

Experiments with various metals indicate that a good average working pressure for most metals is about 30,000 psi. An approximation of working pressure is obtained by the following formula: where:

$$P = \frac{W_r}{A_r}$$

where:

P = Metal Working pressure, psi
W_r = Total load on ram, lb
A_r = Projected area of ram against rubber, sq inches

The total effective load acts on one side of the restrained rubber and the rubber is assumed to transmit the pressure to all the walls of the restraining fixture according to Pascal's Law of pressure transfer in fluids. Because rubber is a solid, it has a certain rigidity modulus to resist shearing or tangential stresses. The exact pressure transmitted to the working surface will be reduced accordingly. The amount of pressure transmitted depends on the type of rubber used. The actual working pressure needed to obtain proper joint tightness is usually found by trial and error. Deformation should be about 0.003 inch per inch, depending on the kind of tube material.

Fixture: Comparatively large initial clearances are possible in rubber clamping fixtures because the rubber rings return to their original shape when load is removed. Clearances between parts surrounding the ring can be as large as 0.015 inch without the rubber extruding into them.

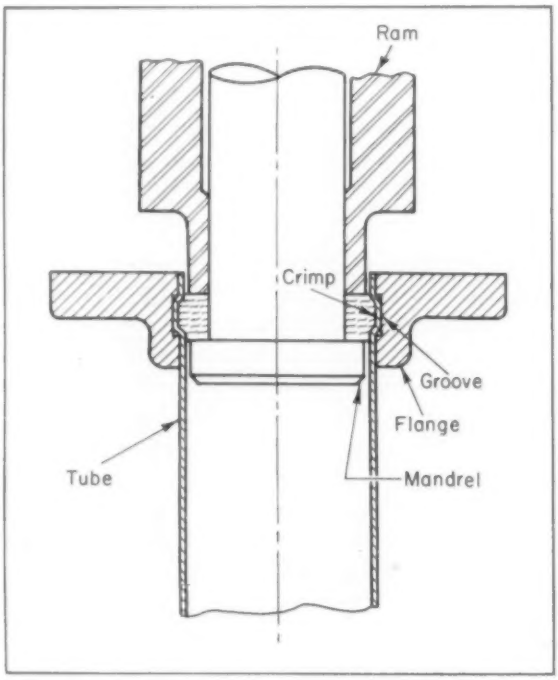
Since these fixtures do not require lubrication, this process is clean and dry. The operator inserts the assembly in the press, positions it correctly and presses a floor pedal to operate the loading ram.

Once the proper press and tooling is selected or designed, parts can be joined for an indefinite period with only occasional replacement of the rubber ring.

Part Design

Ratios of groove width and depth to wall thickness depend on requirements of the joint for leakage

Fig. 2. Forming tube internally by rubber forming method.



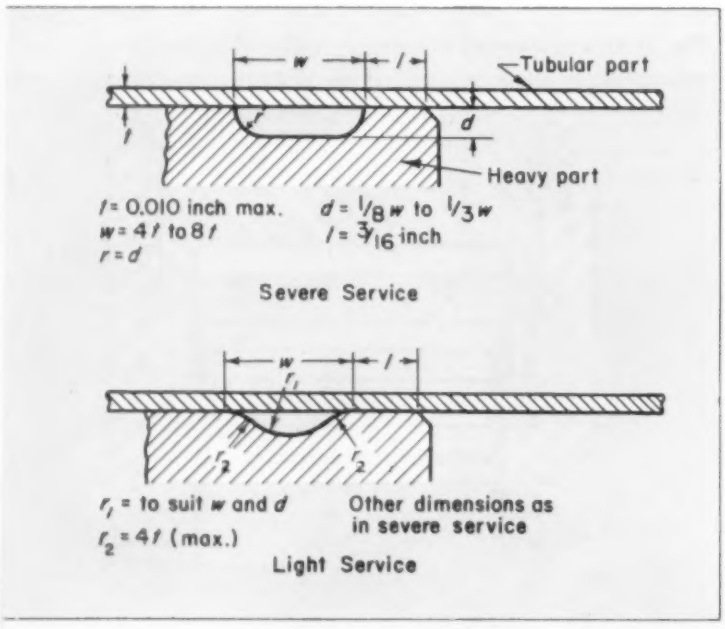


Fig. 3. Forming groove designs for severe and light service.

ance, torsional strength, axial stiffness and ability. Typical groove designs are shown in 3. For severe service, the groove is flat-bot- ed and has a small radius at each side forming p corners at the point of contact with the thin led tubular part. The sharp edges dig into the e after crimping and give a high resistance to al thrusts. In designing grooves for light serv- , sharp edges are broken for smooth contour d to prevent splitting of metal.

When the proper wall thickness, t, has been elected, minimum groove width, w, can be safely pproximated by making it 4 to 8 times the wall hickness. Depth, d, can be taken as $\frac{1}{3}$ to $\frac{1}{5}$ w. For severe service, the corner radius should be qual to the depth.

Shape of the deformation in the thin-walled member depends on the groove shape in the heavy part. Results with wide, narrow and shallow grooves, are shown in *Fig.* 4. The crimped metal does not completely fill the groove because of spring-back. More deformation occurs with wide grooves than with narrow. Shallow grooves have limited holding power and are used when the parts are to be disassembled occasionally. By proper proportioning of the groove, spring action of the crimped portion can compensate for differential expansion between parts of dissimilar metals.

Metal Characteristics: Metals being clamped together should be as ductile and have as low a yield point as the application permits. Ordinarily, metal hardness should not be greater than Rockwell B60. Easily deformed metals, such as annealed copper, tin and aluminum, can be worked more readily than brass and steel. However, harder materials will deform satisfactorily if the amount of displacement and the angle of bend is low. Materials to be joined must be of uniform structure and hardness to avoid cracks and irregular distortion.

Shown in *Fig.* 5 are comparisons of stress-strain curves for three typical metals. The degree of the work strain or deformation must be sufficient to stress the material at the joint well into the plastic region. Elastic recovery can be reduced to a minimum by an excess of pressure during the forming of the joint.

Limitations

Rubber clamping techniques are usually applied only when at least one of the members to be joined has a wall thickness of 0.030 inch or below. The method is occasionally used when the lighter member has a wall thickness up to 0.1 inch.

Usually, limitations in the use of this process are caused by designs in which the joint is inaccessible to the usual clamping tools. Attempting to join two thin shells without a backing mandrel causes

Fig. 4. (below) Joints resulting from various groove sizes.

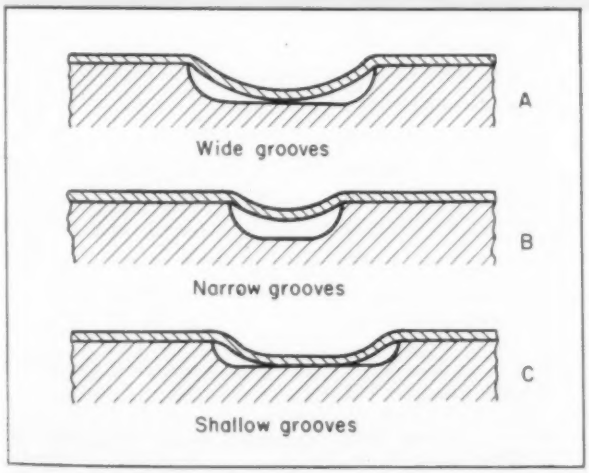
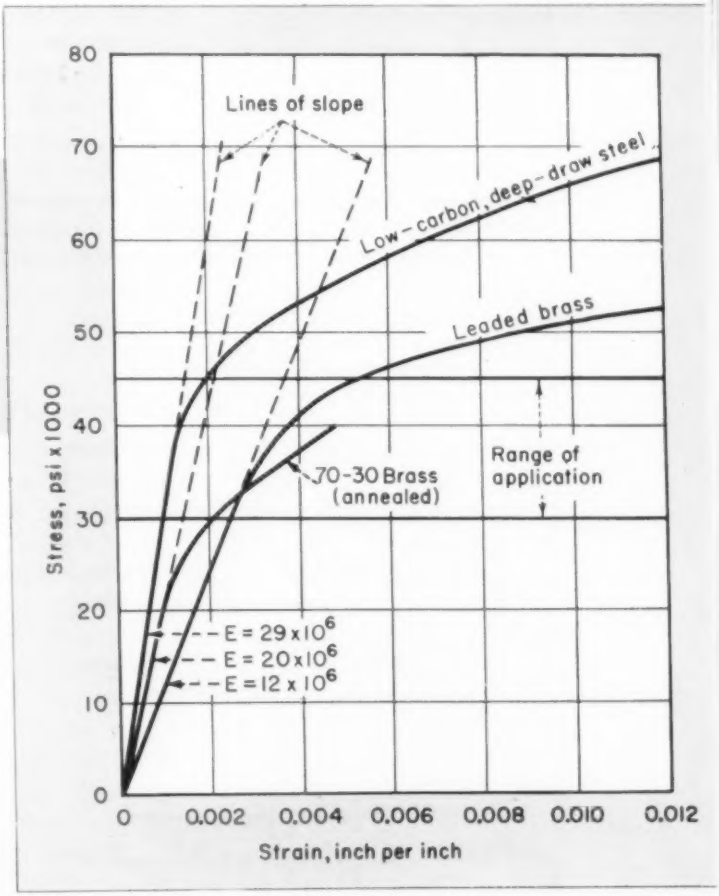
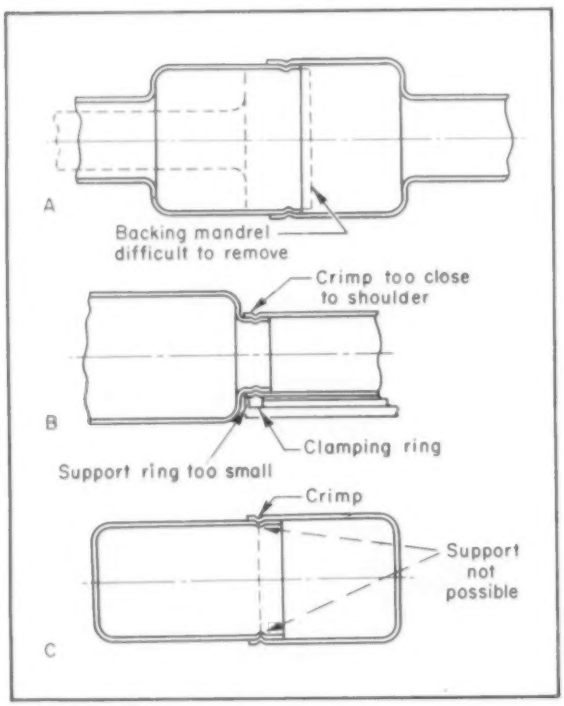


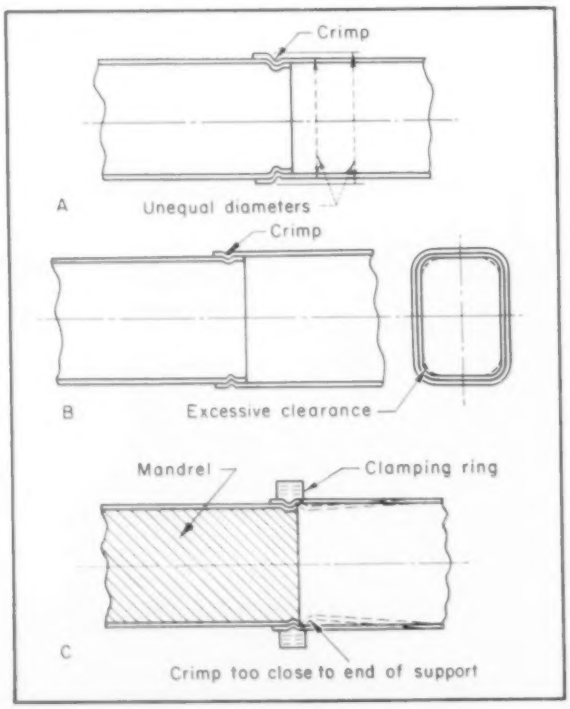
Fig. 5. (lower right) Stress-strain curves. By comparison, the steeper the straight line portion of the curve and the higher the curved portion, the greater is the difficulty forming these metals.



pressures which will buckle the pieces before the joint is formed. If the design can be modified to permit the insertion of a backing mandrel, a successful joint can be formed.

Where removing a standard backing mandrel would be difficult because of the part design, *Fig.* 6-A, an expandable mandrel should be used. However, this method is slower and might mar the work where joints contact the piece, particularly after the mandrel parts become worn.





Joints must be located away from a large shoulder, *Fig.* 6-B, to permit access of the clamping fixtures. This can be done by reducing the diameter and thickness of the rubber ring to a minimum to decrease necessary overhang of the backing shoulder with a corresponding reduction in thickness.

Certain part design pitfalls should be avoided. One is created when there is a small difference in diameter between shoulders on the sides of the locking groove, *Fig.* 7-A. A large axial thrust on the thin-shelled part, or an unbalanced load on the mating part will force the work away from its correct position. Unsupported axial pressures on each side of the joint should be balanced as nearly as possible.

Non-cylindrical work *Fig.* 7-B, might not join satisfactorily if clearances at the restraining surfaces on each side of the rubber ring exceed about $\frac{1}{64}$ inch. Excessive extruding of the rubber may occur where accurate fitting of the forming holders is difficult.

If the forming ring is placed too close to the end of the backing mandrel, *Fig.* 7-C, the rubber exerts pressure beyond the supported section. This results in collapse of the unsupported portion. Distance between the edge of the groove and the end of the supporting mandrel should be a minimum of $\frac{3}{16}$ inch. A smaller distance usually requires too much precision in locating the work with reference to the edges of the forming rubber.

As an example of the reliability of the joints formed by this process, fluid tightness of rubber crimped joints has been tested by filling 0.025-metal tubes with air at 100 psi. The containers were immersed in water for one month without loss of pressure.

Application

Depending on the pressure applied, difficult junctures ranging from flexible joints and sliding fits to hydraulic seals and mechanically-rigid connections can be produced. The size and shape of contour for locking grooves or cavities in the mating parts can be varied to suit different design requirements. Design is simplified because only slight contour changes are needed for a satisfactory joint.

Rubber clamping is especially suitable in the manufacture of products requiring tightly bonded joints, such as fluid containers, cooking wear, fire extinguishers, electrical fixtures, pneumatic circuits and machine tools. This process is of most use when producing assemblies in large quantities.

Fig. 6. (upper left) Joint designs unsuitable for rubber clamping.

Fig. 7. (lower left) Types of joint designs to be avoided for rubber clamping applications.

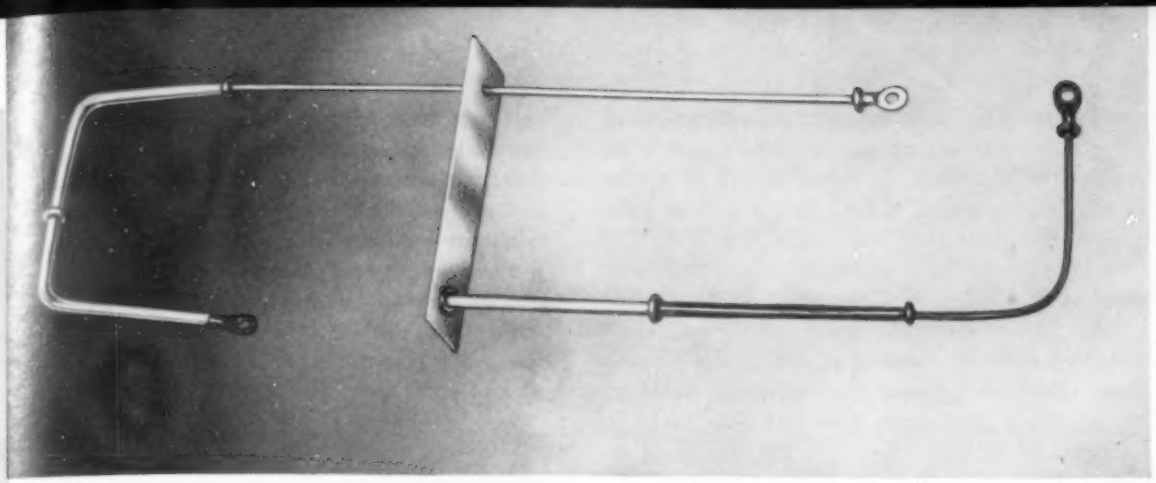


Fig. 1. Illustrative of several types of cold pressure welds, this assembly, includes joints between different sizes and forms of similar and dissimilar metals.

cold pressure welding

capabilities and tooling

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COLD PRESSURE WELDING is a method of joining metals without application of heat. Clean interfaces of relatively soft metals are kneaded and flowed together by tooling of special configurations. Wrought metals, including aluminum, copper, lead, tin, nickel, silver and platinum, can be joined to themselves and to each other, *Fig.* 1. Generally, ferrous metals cannot be welded in this way.

Electrical grades of copper can be welded easily. The EC grades of aluminum can be successfully welded in all tempers. The aircraft alloys can be cold pressure welded in the 0 condition. Heat treated after joining, these welds show a homogenous structure that cannot be attained by any other welding process. Cold pressure welding in the heat treated condition is not generally satisfactory. The most difficult to weld of the common aluminum alloys is 56S, but the English have been successful in welding it. Most of the softer grades of brass are weldable.

Some metals and alloys have not yet been successfully welded but they cannot be definitely excluded because careful design of the tooling, study of the application and development of a special technique may result in satisfactory joints. Some cast aluminum and copper parts have been cold pressure welded to wrought metal parts, for example, even though castings should generally be excluded from this process.

Preparation of Interfaces

A clean oxidized surface on aluminum foil can be welded with a joint strength equal to that of the foil. If the surface is slightly contaminated, poor welds or no welds result. This is true for aluminum foil up to about 0.006 inch thick. In some recent tests on 0.004-inch aluminum foil, where comparisons were made between clean oxidized foil and mechanically scratch-brushed foil, it was found that the latter gave welds of about three times the average strength of the former. On any aluminum foil or sheet over 0.006 inch thick, or on foil or sheet of any other material, mechanical cleaning or scratch brushing is necessary.

Generally speaking, that cleaning operation is best that gives a surface most like a galled surface.

Abstracted from paper 22T37, "Cold Pressure Welding," presented at the 22nd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

Scratch brushing must be done with brushes of correct materials run at proper surface speeds to result in the best welds. A prepared surface can be set aside for as long as an hour before welding with no noticeable deterioration of weldability.

Surfaces to be cold pressure welded are best prepared by some process that crushes, tears apart or galls the surface of the metal and removes contaminants, especially those of an oily nature. Fingerprints effectively prevent cold pressure welding. On aluminum, pure oxide does not seem to be a contaminant. Its only effect is to take up space at the weld and thus weaken it.

A freshly cut surface is excellent for welding. Cutters that have been cutting copper can be switched to aluminum with no loss of weld strength. Cutters that have been used on aluminum, however, when used to cut copper, can smear aluminum over the first few copper faces. The first few welds would thus have the weaker strength of aluminum. A cutter that is smeared with a thin film of the metal to be cut gives better results than a clean cutter.

Types of Welds

Foil: Cold pressure welds in foil, *Fig.* 2, seem to follow no workable formula. Die design, as with all cold pressure welding, is extremely critical. Foil can be roll welded, although little work has been done in this direction. Condenser tabs, cable shielding foil and electrical contact foil can be welded in simple hand tools with properly designed dies.

Fine projecting lines running in one direction on one die face and a cross direction in the mating die form a large number of contacting points and seem to be the best type. The shape and size of the contacting points is important for good weld strength. The dies can be operated by impact or simple pressure. Rate of force application seems to have no effect. Decorative die designs are practicable within limits for foil welds.

Sheet: For simple pressure spot welds, *Fig.* 3, two sheets are scratch brushed, the prepared surfaces are mated and a die projection is impressed from one side while a blank die supports the other side. The shape of the indenter is critical. The size of the indenter in relation to the thickness of the metal and the penetration of the indenter are also critical. All of these factors, however, are easily determined and fixed. A die will weld many thousands of pieces without appreciable wear.

Die design in which the indenters penetrate from each side give still better welds. Various arrangements of indenters can be used. Roll die types have been used in England. The special nickel and copper bearing alloys used to encase germanium diodes are being welded by the English in large quantities. Cold pressure welds form hermetic seals even though from the standpoint of strength the welds might be poor. Die designs and penetration percentages vary for each metal or combination of metals and for various temper and alloy variations.

Aluminum sheet is easiest to lapweld. Sheets have been butt welded, but tooling problems are greater as the width increases in proportion to the thickness. In butt welding, misalignment must be well

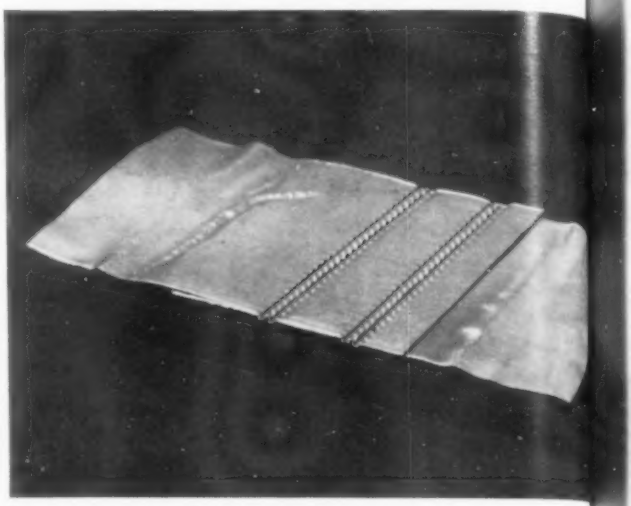


Fig. 2. Typical weld formed by special cold pressure welding tool in 0.001-inch aluminum foil.

under 10 percent of metal thickness. Aluminum sheet has been edge welded to form a T-shape against other sheet. Versatility of the process is indicated by the production of a sheet aluminum teakettle, complete with spout and handle attachments, by the British.

Wire: It is in the field of butt welding aluminum and copper wire that cold pressure welding is making the most important contribution to metal joining techniques. To butt weld wire, the ends are gripped in accurately aligned dies so they overlap a distance of two or three diameters. A double cutter, in which the cutting blades move across spacing blocks in front of the die faces, cuts the wire ends the proper distance from the die faces. The cutter mechanism is removed from between the dies and the dies move toward each other.

The freshly cut wire ends meet and as pressure is applied, the butted wires upset. The clean interfaces of the wires weld together as a result of the pressure and metal flow. The dies continue to move toward each other forcing the upset metal outward and into flash recesses in the die faces. The welded wire is lifted out of the dies. The ring of flash adheres to the wire. This flash is thin at the point of contact with the wire and is easily removed to leave the weld area the same diameter as the wire.

practically all commonly used aluminum and er materials, a weld straight across the diameter he wire has a tensile strength of 95 to over 100 ent of that of the wire. In materials that will l work, such as copper, the metal in the weld is der and stronger than the original and if it uld rupture, the break can always be expected take place outside the weld area.

Considerable work has been done in England on cross welding of aluminum wire. This type of nction could find wide application in the production of racks. Tooling has been designed in the U. S. for such work but is not yet commercially available.

The English have also developed tooling for cold pressure welding stranded wire to flat lugs. This involves mechanical cleaning of each strand, which, to date, has kept this application from commercial use. Cold pressure welding of solid wire to foil, *Fig.* 4, is much easier because of the ease of cleaning.

Plated coatings do not affect the butt welding of wire unless the coating is a thick nonwelding material or of a nature to be smeared across the surface of the wire by the cutter.

Wire solder is easily butt welded. With a resin core, a good weld is secured but where the solder contains a number of strings of flux through it, smearing of the flux across the weld interface reduces the quality of the weld.

Insulating coatings on wire do not always affect welding properties. Fibrous plastic and rubber insulation must be removed since the wire would slip endwise through the insulation in the die. Enamel insulated wire can usually be welded interchangeably with noncoated wire. Formex on hard wire need be cleaned off only at the immediate weld area. Soft aluminum wire covered with Formex can be easily welded without removing the Formex if special cutters are used. With improper cutters, the Formex is smeared across the weld interface.

Wire of different diameters, *Fig.* 1, can be welded together and wires of different materials can be welded together. Wire can be butt welded to strip or wire of different shapes. Sizes of wire that have been successfully butt welded range from 0.032 to $\frac{3}{8}$ inch in diameter. It seems reasonable to assume these limits can be extended in both directions.

Tubing: Tubing is being made by rolling strip into tube shape and cold pressure welding the longitudinal seam. Tubing can be butt welded and good welds have been obtained between both similar and dissimilar metals, with or without flash, although tooling for this is not commercially available yet.

Capillary tubing can be flattened and sealed by cold pressure welding. Standard wire butt-welding tools, with special dies, can be used to make flared butt welds in tubing.

Welding Dissimilar Metals

Dissimilar metals, such as copper and aluminum, can be cold welded. Die design is critical for such applications so that the two metals will have correct relative flows to insure good welds. Relative hardness is usually more important than the type of material, especially in butt welding where the harder material may penetrate the softer material instead of spreading in an upset weld.

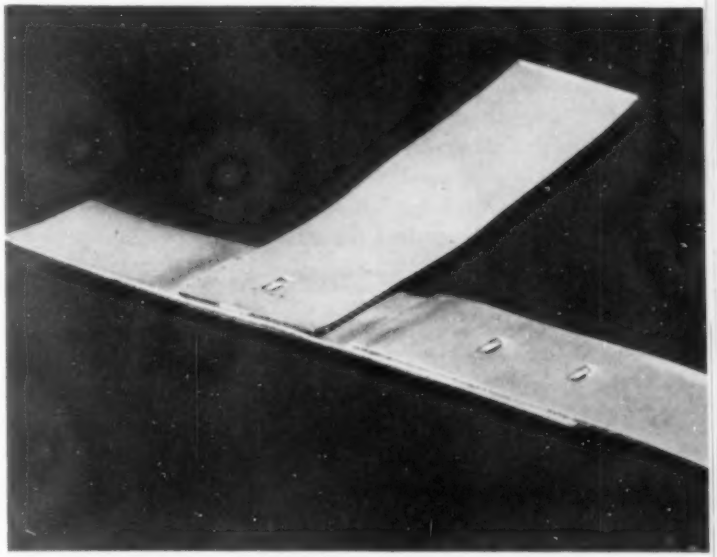


Fig. 3. Tools that have joined these pieces of 0.040 inch aluminum sheet can be used to join pieces with unequal thickness as long as the combined thickness is less than 0.080 inch.

Silver contacts have been cold pressure welded to copper and aluminum switch bars in punch presses on production runs. So far, phosphor bronze and beryllium copper have not been successfully welded to themselves, to each other or to any other metal.

Types of Tools

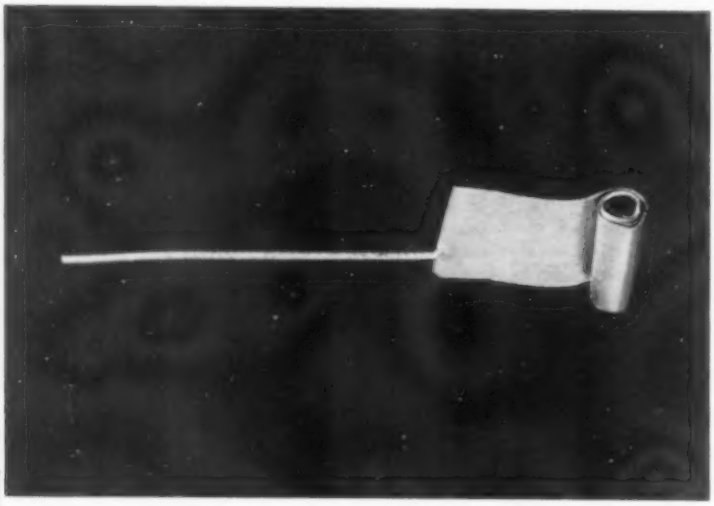
Impact: Impact tools are used for numerous cold pressure welding operations. A simple hand punch struck with a hammer can be used to weld foil or sheet. Die design is critical in relation to thickness and material, but the energy requirement is flexible enough to make possible consistent results with a hand hammer. Electric solenoid, air and spring impact devices have been used to weld both foil and sheet.

The widest use of impact tools is in welding wide sheets. Since the building of a C-frame pressure device capable of reaching the center of wide sheets would be expensive, it is simpler to use an air impact device. Used against a solid opposing surface, excellent results have been obtained.

Pressure: Because there is danger of damaging impact dies by striking blows without metal in position, hand pressure tools and small rotary presses are desirable. Pressure applied by a simple lever tool that brings the dies together, preferably parallel to each other, is effective in cold pressure welding foil and sheet. Such tools are being used to lap weld sheets being fed into roll forming machines. Other applications include: lap welding foil and thin-sheet shielding for electrical cables, welding aluminum window frames and welding screening to frame sections.

For production work, small punch presses are used. When hydraulic presses are used, they should be of the type that uniformly applies pressure. Intermittent pressure, as from a single-action pump, does not give good welds, presumably because the materials work harden and do not flow together. Tests have shown that the same dies in constant pressure devices can give consistently excellent welds.

Fig. 4. Twenty-two gage aluminum wire is here welded to one-mil thick aluminum foil. Equal gage of copper wire can also be welded with the same tool.



Upsetting: The upsetting type of metal flow seems to give the best interflow of metal at the weld interfaces. A set of well-aligned tapergrip dies in which the metal cannot slip, can handle a greater variety of cold pressure welding than can any other tools with this process. However, proper design of the dies and cutting mechanism is paramount. In a recent test, it was found that a change of 0.002 inch in the length of projection of a 0.064-inch dia wire from the die face made the difference between failure and successful welds.

Dependability of Welds

As previously mentioned, cold pressure welds produce excellent hermetic seals, even when the weld would be considered poor from a strength standpoint. Tensile and torsion tests on regular butt and lap welds have indicated strengths above 95 percent of those of the parent metals with rupture usually occurring outside of the weld area. Samples of aluminum and copper wire have been cold pressure welded in several places and then drawn in production wire drawing machines. After the draw, it was impossible to identify the weld area. The English have run extensive electrical conductivity tests on butt welds and could find no difference in resistance values at the weld and in the plain wire.

Fatigue tests have been run on cold pressure welded aluminum wire by welding a length of wire into an endless belt and running it over small diameter pulleys with a loading weight attached. Cold pressure welded joints, being homogenous with the metal of the wire and differing from it only by a degree of cold work, give several times the life in such tests than can be secured from electrically welded or brazed joints with their cast-weld structures.

Project Tinkertoy Drawings Released

Unveiling by the government of the process which makes possible manufacture of certain electronic equipment through mechanized assembly caused considerable interest throughout industry last fall. Results of the experimental project proved that automatic assembly of parts produced from bulk or raw materials is practical, effecting extensive time savings and a minimum essential handwork. Now the drawings for tools required to set up pilot runs or for model-shop production of electronic modules developed under that work, "Project Tinkertoy," are being offered to industry, the Navy Department's *Navy Technical News* announces. Drawings cover jigs, dies and fixtures and an engineering handbook of the process.

Although "Project Tinkertoy" was the name originally assigned to the study experiment during its development stage, the title has been dropped officially in favor of "Modular design of electronics," and "mechanized production of electronics."

Readers, who may be unfamiliar with the original work of the project, may be interested in the comprehensive account of the experiment published in the December 1953 issue of The Tool Engineer.

plastic dies

cut tooling costs

By George C. Adams

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TODAY'S GOAL of the tool plastics industry is to do a specified job cheaper, better and faster than it has been done with previously used methods and materials. In recent years, tool plastics have found many uses and applications in the aircraft, automotive and other industries.

Tool plastics should not be confused with the plastic materials used to make molded, cast or laminated commercial products. Many similar plastic materials do not possess the special properties required in a tool plastic. Materials commonly used in tool plastics are described in the accompanying box.

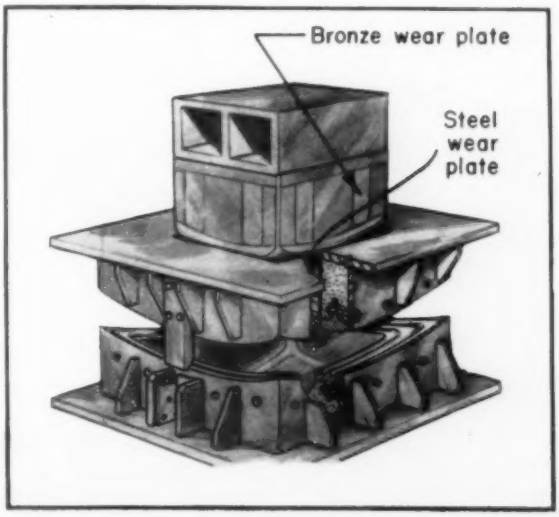
Draw and form dies are being economically made of plastic. Life of relatively inexpensive phenolic castings is extended by reinforcing areas of wear or stress with either cast or laminated epoxy inserts. High impact thermoplastic materials are used alone or with other types of tool plastic.

Types of Dies

Plastic Draw Dies: Nearly all grades of sheet steel and aluminum can be drawn by plastic dies, *Fig.* 1, in either mechanical or hydraulic presses. Metal clearance is not necessary between the mating parts of plastic dies because of the resiliency of plastic. Tool construction time is about one-fourth that of conventional metal tools and at about one-third the cost. These economies make possible limited production of articles which, by other methods, would be impractical. Long run production is also achieved with plastic dies.

Plastic draw dies are similar in appearance to conventional dies, *Fig.* 2. Plastic components are supported by surrounding metal structures which can be quickly and economically fabricated. Although most hand barbering and fitting are eliminated, the finished tool produces parts that are often of superior quality when compared with those produced in a metal draw die.

Fig. 1. Drawing shows nomenclature and construction of typical plastic draw die.



Abstracted from paper 22T45, "Plastic Dies Move Into Regular Production Service," presented at the 22nd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

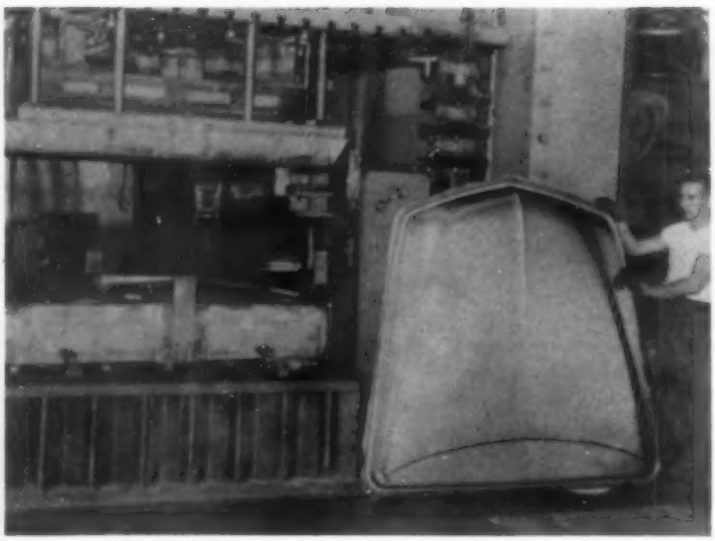


Fig. 2. Plastic die for drawing automobile hoods.

Stretch Dies: Plastic dies for stretch presses, *Fig.* 3, were among the first plastic tools used. Their chief use is in the manufacture of aircraft parts, refrigerator components, and truck and bus panels. Working face areas range from 2 to 140 sq. ft. Weight savings for large plastic tools, as compared to metal tools, is about five to one. Lightweight aids storage, handling and setup.

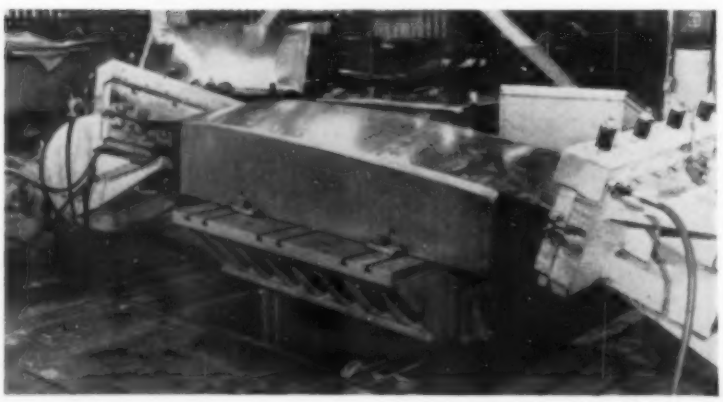
The glass-like surface obtainable on plastic dies eliminates nearly all galling and scratch marks common with metal stretch dies. Shown in *Fig.* 3 is a cross-sectional drawing of stretch-die construction. The base is metal and the core is foam phenolic. A sheet of solid phenolic covers the working face.

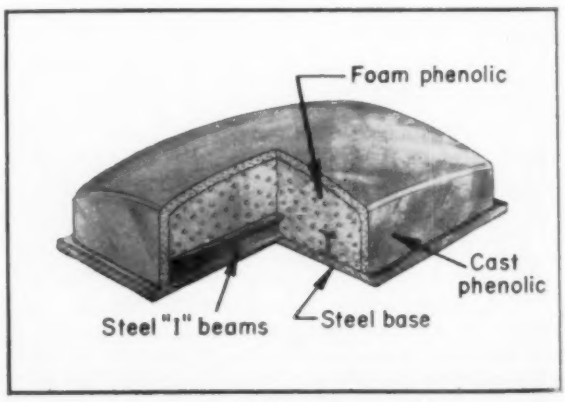
Drop Hammer Dies: Tool plastics used in the manufacture of drop hammer dies are patented forms of castable ethyl cellulose. It is a thermoplastic and can be melted in special equipment. It can be cast in simple molds to the required shape. Ethyl cellulose dies can be melted and processed for re-use, providing obvious savings.

The cavities of some plastic drop hammer dies are metal, and the punch plastic. Plastic punches are resilient on impact, avoiding the necessity for clearance between the punch and die. The punch and die will compress sufficiently to permit the use of various gages of metal in the same tool without alteration. Because of this resiliency, a minimum variation in stamping cross-section thickness results.

Other types of drop hammer tools have plastic cavities as well as plastic punches, *Fig.* 4. The cavity and punch are surrounded in a steel weldment for support. Inner core of the punch is a phenolic tool plastic casting. A layer of hard epoxy laminate sheaths the working surface.

Fig. 3. (left). Stretch die installed in a Sheridan press. No exceptional wear is visible after six years of use. Drawing (right) shows construction of plastic stretch die.





Nomenclature

Phenolic: A thermosetting phenol-formaldehyde compound having a small amount of dimensional change during transition from a liquid to a solid. Oldest of the thermosets used in plastic tooling.

Polyester: Thermosetting material used in conjunction with glass fibers (mat, rovings or woven into cloth) to form a laminate. Use has been somewhat limited by shrinkage during curing.

Epoxy: Latest addition to the thermosetting group. May be used with glass fibers to make a laminate structure in the same manner that polyesters are used. Some can be cast providing the mass does not have an excessive cross-section thickness. All other dimensions may be much larger. Resistant to most of the commonly used chemicals found in greases and lubricants.

Ethyl Cellulose: Tool plastic materials derived from this material belong to the thermoplastic group. Materials are melted and cast similar to metal. Ability to absorb comparatively high impact permits their use for drop hammer dies, hand-form blocks, etc.

he contour is obtained by using simple plaster erns to make the required punch mold. After punch has been completed, it is inverted. The ldment, which will contain the die cavity, is ed above it in closed die position. This permits die to be cast directly against the punch, avoiding almost all costly hand barbering and assuring act duplication of punch and die.

A combination draw and drop hammer tool is own in *Fig.* 5. The die cavity is zinc alloy; the etal cored punch is faced with castable epoxy. Surrounding the punch is a movable thermoplastic ring, similar to a common double-action binder ring. Cross rods retain the ring around the punch. Layers of rubber between the ring and the hammer enable the punch to finish the draw. Hammer action clamps the metal blank between a portion of the die face and the ring, but permits the punch to force remaining metal into the die cavity. This action enables true drawing in a drop hammer. By removing the rubber layers one at a time, a progressive drawing process is obtained. Generally, the depth of draw is limited only by the properties of the metal blank.

Additional savings result by making the die cavity of phenolic, surfaced with a tough epoxy laminate. Such a cavity must be surrounded by a steel weldment for support. Metal reinforcement for the punch is not necessary if it is made of ethyl cellulose. This type of die set is especially useful for experimental work.

Mold Construction

Plaster molds, developed from master molds, are sprayed to give the required surface finish and parting properties. The plaster mold is supported by and raised to working height with a structure of welded tubing, *Fig.* 6. Large areas in the mold are filled with expanded metal lath for reinforcement. A layer of tool plastic, with a consistency similar to putty, is troweled into the lath. After curing, this layer forms a continuous backing to which the working face of the laminating mold will bond, assuring a stable mold. The plaster mold, tubular supporting frame and coating layer are mated and tied together with plaster and hemp. After these parts are assembled, the main body of the plastic mold is cast in them. Standard pouring gages and risers permit the included air to escape during casting. After separation from the mold, flash is removed and the surface buffed. Hand barbering is reduced to a minimum.

To use the advantages inherent in large laminated plastic parts relatively large and complicated molds are often required. Normally, this would create an expensive tooling program of long duration. By using plastic tools, tooling time and costs can be reduced enough to permit use of the design possibilities of laminated parts. This type of tooling has proven successful in manufacturing plastic automobile bodies.

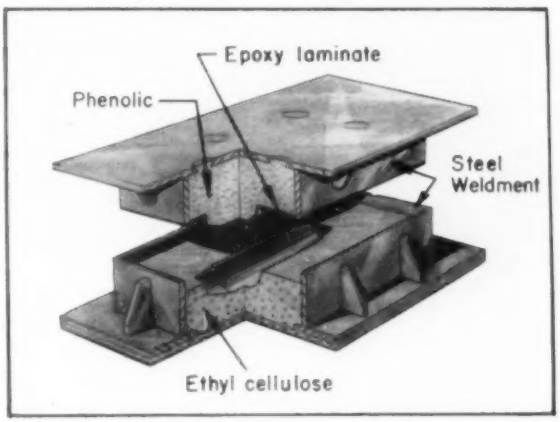
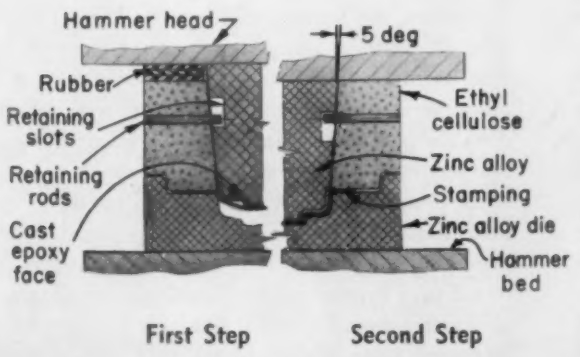
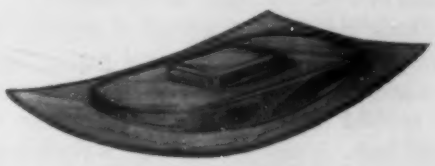
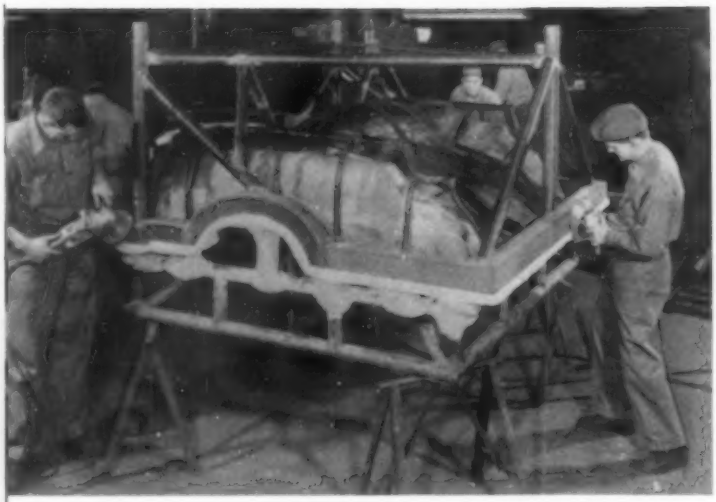


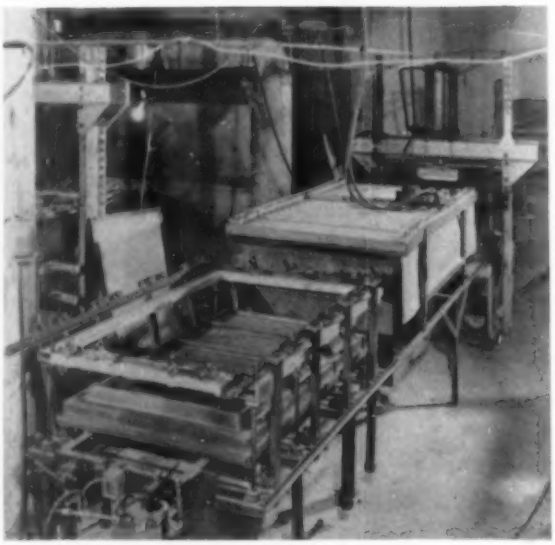
Fig. 4. (upper right) Construction of plastic drop hammer die.

Fig. 5. (below) Section of combination draw and drop hammer die. Drawing action is actuated by layers of rubber.









Typical Application

Tooling and equipment required to make refrigerator door liners is shown in *Fig.* 7. Elements include a movable heating unit mounted on a track, a mechanically actuated post-forming die and a clamping frame. Sheet material is hand loaded and secured in the clamping frame. The heating unit is moved into position and the sheet heated. Hot material is drawn into a locked position over the die by the clamping frame, forming an airtight seal between the sheet of plastic and the die. Air between the die and the hot plastic sheet is exhausted. When the vacuum is drawn, atmospheric pressure forces the hot material into the required configuration. A strong blast of cold air chills the door liner, thereby freezing the part form.

Plastic tooling can be used in making many post-formed products from nearly all of the thermoplastic materials fabricated by this process. Mated punches and dies are sometimes used for this purpose. In designing and building these tools, the general techniques previously described are used.

The future should disclose increased advantages in time and money economies to manufacturers of sheet metal and laminated plastic products. This will probably be done by using the right combinations of tool plastic materials in much the same manner as conventional metal tool builders use the various types and grades of steel.

Fig. 6. (upper left) Metal structure, attached to mold, is used to support mold and raise it to working height.

Fig. 7. (lower left) Die and clamping frame and heating unit for producing plastic refrigerator door liners.

Plating for Metal Life

In their work with steel core rods, American Meter Co., like other companies, has been searching for a means of increasing productive life of their material. Now it reports that flame-plating has resulted in ten-times longer usefulness.

Flame plating is a method of applying tungsten carbide to the surface of metal parts. The deposit is made in a hard wear-resistant coating that can be applied in thicknesses ranging from 0.002 to 0.010 inch. A major advantage is the low temperature deposition—the base metal does not exceed 400 F while being coated—which keeps physical properties of the base metal unchanged and reduces possibility of distortion to a minimum.

Further, the flame-plated coating has a low modulus of elasticity compared to solid sintered tungsten carbide. This, too, is practical, since a low modulus coating on the base metal will deflect as does the part under load applied, rather than maintain extreme rigidity and possibly crack.

At present, the company is finding their 0.235-inch diameter steel core rods, flame plated, produce over 400,000 bronze alloy meter bushings as compared to a former 60,000 bushings. Similarly, the productive use of a rod 0.294-inch in diameter was increased from 60,000 to 600,000 with a 0.0001-inch wear—within the tolerance of plus or minus 0.001 inch.

Spring Selection *in tool design*

By G. W. K. Clark
Pointe Claire
Quebec, Can.

FOR THE TOOL DESIGNER who may have to design or select a spring only occasionally, available standard spring design data appear complex. These data are for springs used in critical applications. If the designer does not specify the dimensions of springs because of the computations involved, springs must be selected after trial-and-error by the toolmaker. This is unsatisfactory because too frequently the designer has failed to provide adequate space for a properly proportioned spring.

Since the majority of springs required in tooling need not be critically designed, the accompanying table has been prepared for such use. The table can be used to quickly indicate an acceptable spring, within the requirements of tool operation, without requiring the designer to refresh his memory on formal spring design.

The table gives characteristics for three conditions of spring design, where ratios of mean diameter of spring (D) to diameter of wire (d) are respectively: 8, 6 and 4 to 1. It is only necessary for the designer to determine the maximum load (P) that the spring will be required to carry. The estimated load is first looked for in the column where the D/d ratio (spring index) is 8. When the required load figure is located, values opposite it indicate the size of wire that should be used and the product (RN) of two spring factors. The latter value is the product of the spring rate (R), which indicates the load in pounds necessary to deflect the spring one inch, and the number of effective coils (N) of any spring made of this size wire. Having this information, little effort is required to formulate the spring.

For tooling, it is usually desirable to keep the spring rate as low as possible to avoid excessive build up of pressure during the stroke of the spring. When a spring must handle a high initial load, a high rate may be necessary to avoid impractical initial deflections.

Since space available for the spring commonly restricts the number of coils, final selection of the proper spring consists of arriving at compromise values for R and N, the product of which will equal the tabulated value. Calculation of the compromise values is simple.

Although the allowable deflection of spring coils is the subject of involved treatment, for tooling applications a good rule is that spring deflection should not exceed 25 percent of the extended length of the spring. Clearance must be allowed between coils of compression springs when in working position.

When use of the values for a spring index of 8 fails to give a sufficiently compact spring, values for indexes of 6 and 4 are tried in turn. Inability to effect a solution using values from the index 4 column indicates the need for a closer examination of the problem.

Safe load values are based on a stress of 50,000 psi permitting some latitude in the design of springs. This built-in safety factor diminishes when using values from the lower ratio columns. The table is equally applicable for tension and compression springs. The actual number of coils in a compression spring, however, is two more than the effective number.

EXAMPLE: Specify four equal compression springs to move a 264-lb fixture part vertically. Working stroke for each spring will be 2 inches and, because of space requirements, outside diameter cannot exceed 1.5 inches.

SOLUTION: Each spring will support 66 lb at the top of the 2-inch working stroke. Consulting columns on the next page for a spring with an index of 8, a wire with a diameter of 0.162 inch is found to carry 66 lb. RN for these conditions is 455. Assuming a value of 20 lb per inch for R, initial deflection is 66/20, or 3.3 inches. This, added to the working stroke, gives a total deflection of 5.3 inches. The number of coils is 455/20, or 23 + 2. Solid length of this spring is (0.162) (25), or 4.05 inches. Free length of the spring is 5.3 + 4.05, or about 10 inches, including wire clearance when closed.

This spring is unsatisfactory because deflection exceeds 25 percent of free length and the final load would be 66 + (2 x 20), or 106 lb, which exceeds the tabulated value. Failure in the first attempt indicates need for a more critical approach. Using an index of 6 and determining the largest diameter wire that could be used and satisfy the outside diameter requirements—solve: $(1.5 - d)/d = 6$ for d —the wire diameter is found to be 0.207 inch; value of RN is 1378. Assume a value for R of 20 lb per inch and the total deflection is 5.3 inches as before. The number of coils is 1378/20, or 69 + 2 and the solid length of the spring is (0.207) (71), or 14.7 inches. Adding 1/32-inch clearances between coils in the closed position, 70 x 1/32, or 2.18 inches, the closed length of the spring is 16.88 inches. Free length of the spring is 16.88 + 5.3, or 22.2 inches.

This spring is within deflection limits and the load of 66 + 2(20), or 106 lb, is within 143 lb given in the table. Specifications for the springs would then be: Four springs of 0.207-inch diameter wire with mean coil diameter of 1.242 inches, 69 effective coils and a 22.2-inch free length; load to deflect 1 inch, 20 lb.

Spring Index (D/d) = 8		Wire Diameter (d) (inches)	Spring Index (D/d) = 6		Wire Diameter (d) (inches)	Spring Index (D/d) = 4	
Safe Load (lb)	*RN*		Safe Load (lb)	*RN*		Safe Load (lb)	*RN*
0.21	25.2	0.009	0.27	60	0.009	0.41	202
0.23	26.7	0.0095	0.30	63	0.0095	0.45	213
0.27	29.2	0.0104	0.36	68	0.0104	0.54	234
0.35	33.1	0.0118	0.46	78	0.0118	0.70	265
0.41	36.0	0.0128	0.55	85	0.0128	0.82	288
0.44	37.1	0.0132	0.58	88	0.0132	0.87	296
0.49	39.2	0.014	0.65	93	0.014	0.98	314
0.56	42.1	0.015	0.75	100	0.015	1.12	337
0.66	45.5	0.0162	0.87	108	0.0162	1.31	364
0.75	48.6	0.0173	1.00	115	0.0173	1.50	388
0.81	50.5	0.018	1.1	120	0.018	1.62	404
1.00	56.1	0.020	1.3	133	0.020	2.00	449
1.3	64	0.023	1.7	153	0.023	2.64	513
1.6	70	0.025	2.1	166	0.025	3.12	562
1.9	78	0.028	2.6	186	0.028	3.92	629
2.6	88	0.032	3.4	213	0.032	5.12	718
3.1	98	0.035	4.1	233	0.035	6.12	786
4.2	115	0.041	5.6	273	0.041	8.40	921
6.5	132	0.047	7.3	313	0.047	11	1056
7.5	152	0.054	9.7	360	0.054	15	1213
10	177	0.063	13	419	0.063	20	1415
13	202	0.072	17	479	0.072	26	1617
16	225	0.080	21	532	0.080	32	1797
21	258	0.092	28	612	0.092	42	2067
28	295	0.105	37	699	0.105	55	2359
36	337	0.120	48	798	0.120	72	2696
46	380	0.135	61	898	0.135	91	3033
55	416	0.148	73	985	0.148	110	3325
66	455	0.162	87	1078	0.162	131	3640
79	497	0.177	104	1178	0.177	157	3976
92	539	0.192	123	1278	0.192	184	4313
107	581	0.207	143	1378	0.207	214	4650
127	632	0.225	168	1498	0.225	253	5055
149	685	0.244	198	1625	0.244	298	5482
173	722	0.263	230	1711	0.263	346	5774
200	795	0.283	266	1884	0.283	400	6358
236	862	0.307	314	2044	0.307	471	6896
274	930	0.331	365	2233	0.331	548	7436
327	1017	0.362	437	2410	0.362	655	8132
384	1106	0.394	517	2623	0.394	776	8851

news

featured this month

Facilities of the Kellogg Center, Michigan State College's hotel and headquarters for continuing education, will be utilized for the tool engineering conference being sponsored in May by the Lansing, Jackson and Grand Rapids chapters.

On-Campus Conferences

scheduled at Purdue and Michigan State

By Nancy L. Morgan
News Editor

Two on-campus tool engineering conferences will be sponsored in May by the National Education Committee and ASTE chapters in Michigan and Indiana.

The first will be held May 15 at Michigan State College in East Lansing, in cooperation with the department of mechanical engineering. Sponsoring chapters are Lansing, Jackson and Western Michigan. Members from Detroit, Muskegon, Pontiac, Saginaw Valley and Waterloo Area are also invited to participate.

The following week, on May 22, the Indiana ASTE Council is holding its second annual conference for tool engineers at Purdue University in West Lafayette, Ind., in cooperation with the department of general engineering. Participating chapters include: Calumet Area, Evansville, Fort Wayne, Indianapolis, Richmond, and South Bend.

Full Day's Schedule

The theme of Michigan State's conference is "Tooling Problems Solved by Practical Men." A full day's program is planned, including tours of the school of engineering and the mechanical and electrical laboratories, five technical sessions, a luncheon meeting and a banquet in the evening.

A majority of the activities will be held at the Kellogg Center, a recently built hotel and headquarters for special meetings where over-night accommodations will be available.

National representative of ASTE taking part in the program are: Roger F. Waindle, immediate past president and a member of the Board of Directors; Harry E. Conrad, executive secretary; and Prof. J. N. Edmondson, member of the National Education Committee.

ASTE wives are invited to attend and a special program has been planned for their enjoyment. These activities will include tours of the Kellogg Center and the Michigan State campus, and visits to the college radio and television studios.

Morning Activities

Conference visitors may register any time between 8 and 9 a.m. at the Kellogg Center. Tours are slated for 9 to 10:30 a.m.

The first technical session, scheduled for 11 a.m., will feature a talk on "Modern Machine Tools and Increased Productivity." The speaker will be Swan E. Bergstrom, vice president of Cin-

cinnati Milling Machine Co. and a past president of the National Machine Tool Builders Association.

The welcome address will be made by Prof. L. C. Price, head of the department of mechanical engineering, and the reply will be given by Prof. J. N. Edmondson of the National Education Committee. Chairman will be R. F. Gietzel, past chairman of the Lansing chapter and chairman of the conference committee.

At the luncheon meeting, Mr. Conrad, ASTE's executive secretary, will act as emcee. Program speaker will be Prof. Paul D. Bagwell, head of the department of communication skills at Michigan State.

Afternoon sessions will offer discussions on four topics. "Machining of Jet Engine Alloys" will be discussed by John Howe, supervisor of production engineering, and Ray Burns, production engineer, Oldsmobile Division of General Motors Corp., Lansing, Mich.

"Small Die Design and Maintenance" will be covered in material furnished by the Western Michigan ASTE chapter. Session chairman is Charles Bonczayk. Jackson members will provide speakers to discuss the subject "Gears and Their Fixturization." Fred Foote is session chairman. "Plastics for Tooling" will be covered by George Rice, sales engineer, Renaud Plastics, Inc., Lansing.

Speaking at the 6:30 p.m. banquet will be Parker Holden, president of Holden, Clifford & Flint, Inc., Detroit industrial advertising agency. Past President Waindle will be master of ceremonies.

Arrangements for the conference were made by a committee headed by R. F. Gietzel. Other members are: Fred Foote, Jackson chapter; John Pridgeon and Charles Bonczayk, Western Michigan chapter; Robert E. McKee, National Education Committee; Keith Odle, MSC Continuing Education Service; Assoc. Prof. R. L. VanDerSlice, MSC; William Janetzke, Harry Keehne, Harry Wilson and Glen Crippen, all of Lansing; and Marvin J. Bunting, of the headquarters staff of ASTE.

Purdue Program

Purdue conference activities will get under way with the registration at the Michael Golden Engineering Laboratories from 7:15 a.m. to 8:15 a.m., followed by tours of the manufacturing laboratories. Activities for the day include four technical sessions, a luncheon meeting with an address by Roger F. Waindle, immediate past president of ASTE, and a banquet with Herbert L. Tigges, president of the National Machine Tool Builders Association, as the speaker.

Invitations have been extended to ASTE wives to participate in the specially planned ladies' activities, which will be highlighted by a luncheon program.

The opening session of the conference will feature a welcome address by Dr. P. F. Chenea, assistant dean of the schools of engineering, Purdue University. Presiding will be Joe Penn, of the Indiana ASTE Council and past chairman of the Indianapolis chapter.

A discussion entitled "English — A Tool" will be presented at this meeting by E. Glenn Griffin, assistant professor of English at Purdue.

At the first purely technical session, a panel of speakers will cover the topic "Weldments." Moderator will be Paul Vierling, past chairman of the Evansville chapter. Participants include: P. W. Case, assistant professor of manufacturing processes, Purdue; R. H. Bish, manager of manufacturing services and facilities, Electro-Motive Division of General Motors Corp., La-Grange, Ill.; John Randall, superintendent of welding development and plastic prototype, stamping press department, Ford Motor Co., Dearborn, Mich; and Frank C. Kardevan, sales engineer, Lukenweld Division of Lukens Steel Co., Coatsville, Pa.

F. C. Hockema, vice president and executive dean at Purdue, will make the welcome address at the luncheon. Past President Waindle will also deliver a speech. Toastmaster will be H. A. Bolz, head of the department of engineering. Leslie L. Thill will preside.

Two Panel Discussions

"Titanium" will be discussed by four members of the first afternoon panel. They are: L. V. Colwell, professor of production engineering, University of Michigan, Ann Arbor, Mich.; Dr. Leo P. Tarasov, research and development department of Norton Co., Worcester, Mass.; E. J. Krabacher, senior research engineer, Cincinnati Milling Machine Co., Cincinnati, Ohio; and Hans Coster, instructor in manufacturing processes, Purdue University. Moderator will be Don Welbaum, past chairman of the Fort Wayne chapter of ASTE.

Another panel will feature discussion on the topic "Automation." Participants will be: H. H. Young, assistant professor of industrial engineering, Purdue; Melvin D. Verson, executive assistant, Verson Allsteel Press Co., Chicago; Robert A. Schafer, development engineer, National Automatic Tool Co., Inc., Richmond, Ind.; and R. W. Holman, assistant general superintendent, Gary sheet and tin plant of United States Steel Corp., Gary, Ind.

In addition to Mr. Tigges' address at the dinner meeting, conference visitors will also hear H. D. Hiatt of Allison Division of General Motors Corp., who will be toastmaster, and Russ Culbertson, who will be presiding as chairman.

Chapter representatives to the Indiana Council of ASTE, which is sponsoring the second annual conference for tool engineers, are pictured here. Front row, from left: F. F. Own, Carl Darger, Don Welbaum, L. I. Thill, O. D. Lascoe, Paul Vierling, Joe Penn and Harold Houseworth. Second row: John Huser, John Berker, B. Gerard, V. D. Eley, E. E. Chapman, H. J. Helton, and Joe Enright. Back row: Lorance Sterns, Ted Harding, M. M. McClure, James Nelson, Dick Garber, C. Haugk, John E. Race, I. Zacker, Dick Good, E. Gildea, and M. Rosenberger.

ASTE Announces West Coast Exposition

Five-Day Event Scheduled for Los Angeles Shrine Auditorium the Week of March 14-18, 1955

By Edith R. Saunders
Assistant News Editor

The long and much anticipated ASTE West Coast Exposition has been officially scheduled for the week of March 14-18, 1955, in Los Angeles, according to an announcement by Harry E. Conrad, executive secretary of the Society.

"Because of the great strides in industrial development and expansion on the West Coast, this Exposition will serve one of the fastest growing industrial regions in the United States," reports Mr. Conrad.

At a series of kick-off meetings to lay the groundwork for the Exposition, Mr. Conrad attended several luncheon and dinner meetings with the Executive Committees of Denver, Salt Lake City, Phoenix, Tucson, and Albuquerque chapters.

Climaxing this tour, Mr. Conrad attended a meeting of nearly 50 national officers, committeemen, and representatives of eight West Coast chapters at the new Statler Hotel in Los Angeles. All the California chapters were represented, as was Tucson.

Mr. Conrad reported at the meeting that the West Coast Exposition promises to be one of the largest ever held by ASTE. It will bring together, under one roof, the latest technological advancements in production equipment and manufacturing processes and provide valuable integrated technical conferences, panel discussions, forums, films and paper presentations.

While still almost a year away, the Exposition has already stirred much attention and enthusiasm in manufacturing circles. ASTE National Headquarters in Detroit has received dozens of letters from companies wanting to reserve exhibit space.

The exhibit hall and hotel headquarters have been selected. The Shrine Auditorium, with accommodations for more than 300 exhibitors, will be the site for the 1955 Exposition. It has ample facilities for the traditional technical meetings and industrial conferences associated with ASTE shows.

Official headquarters for the Exposition Week will be the Ambassador Hotel, in Los Angeles, which will house all exhibitors and ASTE's official national family.

Among national ASTE officials pres-

National officers are flanked by members of the West Coast chapters, attending a meeting in Los Angeles to get plans rolling for the 1955 West Coast Exposition. Harry E. Conrad, is third from the left in the front row; Wayne Ewing is far right; and Ben Hazewinkel is pictured third from left in the back row.

Enroute to Los Angeles, Mr. Conrad met with the 1953-54 executive committee of the Tucson chapter for dinner at the El Corral. Pictured are: from left, seated, Mr. Conrad; Jim Beach, Tucson chairman; Harry McClain, second vice chairman; Bob Howard, treasurer; Ted Kresler, alternate delegate; and Chester Vermilyea, Phoenix chapter chairman. Standing are: Glen Quillin, first vice chairman; Cy Jacobson, secretary; and Jim Matthews, delegate.

Another stop on Mr. Conrad's West Coast tour was a luncheon meeting at the Brown Palace Hotel with the 1953-54 Denver executive committee. Seated are: Warren Foss, past chairman; Clint Helton, chairman; Mr. Conrad; and Willard Krieger, first vice chairman. Standing are: George Buckel, secretary; Alex Wilcox, treasurer; Elmer Burger, education chairman; Norval Allen, second vice chairman; Clyde Elliot, program chairman and F. J. Geoffroy, past chairman.

ent at the Los Angeles meeting were: Wayne Ewing of Los Angeles, assistant secretary-treasurer of ASTE; Ben Hazewinkel of South Gate, Calif., a national director of ASTE; Art Lewis of Glendale, Calif., a past national director; Ralph Chrissie of Los Angeles, a member of the national program committee; and Lawrence H. Cook of Menlo Park, Calif., area captain of the national membership committee.

Chapter chairmen present included: Carl L. Almquist of Los Angeles; David A. Gustafson of Golden Gate; Arthur E. Crom of San Diego; Carlyle E. Blanchard of Long Beach; Peter Carter of San Gabriel; William C. Lanyon of Santa Clara Valley; and Rudolf Regen of San Fernando Valley.

Seated at the head table during the West Coast Kick-Off Meeting in Los Angeles are: from left, Ralph Chrissie, of the National Membership Committee; Ben Hazewinkel; Harry Conrad; Wayne Ewing; and Art Lewis, a past national director.

For further Exposition information, contact:

Robert E. Ahrensdorf, *representative of The Tool Engineer, 1140 Wilshire Blvd., Los Angeles 17, Calif.*

All eight of the California chapters were represented at the West Coast Exposition Kick-Off Meeting. Tucson chapter also had a representative there. This picture shows the entire group of nearly 50 national officers, committeemen, and chapter officers who assembled at the Statler Hotel.

Mr. Conard

Frederick U. Conard Dies Suddenly

Frederick U. Conard, president and general manager of Pratt & Whitney and Chandler-Evans Divisions of Niles-Bement-Pond Co., West Hartford, Conn., and president of the Potter & Johnston Co. (subsidiary), Pawtucket, R. I., died suddenly on March 14 at his home in West Hartford.

Mr. Conard was widely known throughout this country and abroad in business and metalworking fields. In 1947, he was elected president of these companies after having served 28 years in various executive capacities with Underwood-Elliot-Fisher Co.

He held directorships in numerous Connecticut business organizations and was very active in may civic endeavors. He was a graduate of Stevens Institute of Technology and was a Lt. Colonel (retired), U. S. Army Reserve.

A Tight Squeeze!

ASTE's chapter editorial chairmen are old hands at breaking records for THE TOOL ENGINEER and they did it again this month! Never before have so many photographs been sent in for a single issue. Because we wanted to publish as many as possible, there wasn't space available to bring you a four-page article on the chartering of three new chapters—Western Reserve in Ohio, Henrick Hudson in New York and Merrimack Valley in Massachusetts. Look for this special feature next month.

Canadian Regional Meeting Attracts Representatives from Eight Chapters

The annual Canadian Regional Meeting, held at the Iroquois Hotel on February 20, brought nearly 30 ASTE members to Galt, Ont., for a day-long session.

Representatives from the eight Canadian chapters, including Grand River Valley, Hamilton District, London-St. Thomas, Montreal, Niagara District, Peterborough, Toronto and Windsor, participated. Buffalo chapter was also extended a courtesy invitation to sit in at the meeting. Grand River Valley was the host chapter.

ASTE national officers on hand were Gerald A. Rogers of Montreal, a national director of ASTE; William A. Dawson of Hamilton chapter, a member of the National Professional Engineering Committee; and Allan Ray Putnam, assistant executive secretary of the society.

Following the pattern of previous meetings, its main purpose was a free-flowing exchange of ideas and a glance at last year's record of accomplishments. On the agenda were discussions of ways and means to increase membership, and of standardizing membership requirements.

It was a chance to iron out any problems regarding chapter work and liaison with National Headquarters. As always, the group presented ideas on being of greater service to industry and the community, and emphasized the importance of ASTE's participating in the Canadian Trade Fair again this year.

Hosts from Grand River Valley chapter included John W. Ward, chairman; Percy L. Barber, first vice chairman; Roy Robertson, secretary; Carl C. Hawley, treasurer; William Little, editorial chairman; Clarence Henderson, professional engineering committee chairman; David McCready, public relations committee chairman; Alex K. Walker and Joseph D. Strite.

Preator Elected to British Society

Prof. Frederick Preator, head of the Utah State Agricultural College tool engineering department, and a member of the ASTE National Education Committee, has been elected to membership in the Institution of Production Engineers, a society with headquarters at London, England.

The institution is the only representative society of production engineers in Great Britain, and is an exclusive organization with only 9,000 members.

Prof. Preator was trained at Birmingham Technical College, England, and employed at National Physical Laboratory, London. He received a bachelor's degree at Utah State Agrictultural College in 1935 and his master's degree at Wayne University in Detroit.

Representatives who attended the Canadian Regional Meeting are: front row, left to right, Frank A. Ritchie; Charles A. Gareau, Thomas C. Hill, Bruce Mackenzie, John M. Snyder, and Joseph D. Strite. In the second row are: Allan Ray Putnam, assistant executive secretary of ASTE; Gerald A. Rogers, a national director of ASTE; John F. Ward; William A. Dawson, a member of the national Professional Engineering Committee; and Roy Robertson. In the third row are: Frederick W. Dunn, Albert Clarkson, Alex K. Welker, John F. Johnston, C. E. Bulmer, Carl C. Hawley, and William Little. The back row includes David McCready, Louis Jensen, David R. Few, William J. Iekel, Percy L. Barber, Clarence Henderson, and Douglas K. Simpson.

APRIL
1954

Annual Report

American Society of Tool Engineers

American Society of Tool Engineers
10700 Puritan Avenue Detroit 38, Michigan

NATIONAL BOARD OF DIRECTORS

AMERICAN SOCIETY OF TOOL ENGINEERS

Joseph P. Crosby

Roger F. Waindle
Chairman

Harry B. Osborn, Jr.

Howard C. McMillen

Harold E. Collins

Leslie B. Bellamy

Willis G. Ehrhardt

George A. Goodwin

Ben J. Hazewinkel

Gerald A. Rogers

Richard A. Smith

annual report by the president

Your administration has recognized that a growing and active society requires close cooperation between the chapters and the national organization. Needs of the chapters have been carefully studied to utilize the headquarters' staff facilities for their maximum benefit. To further implement the liaison between the chapters and the national administration, National Delegates, elected by each chapter, will represent the chapters at the annual House of Delegates meeting, maintain a continuing link of communication between the chapters and national, and participate in the formulation of an agenda for the House of Delegates meeting on problems of broad chapter implications.

Growth of the Society, both in number of members and in prestige, is continuing at a gratifying pace. The success of the Convention and Industrial Exposition in Philadelphia, which is unprecedented in size and importance in the history of the organization, is indicative of the increasing prestige of the Society. We can look forward with confidence that this growth will continue and that the Society will reach ever higher achievements in the future.

The following brief reports of our major activities indicate more fully the progress of the Society during the past year.

★ ★ ★

R. C. W. Peterson
Secretary

Secretary: Although statistics are not the complete criterion of the past year, they are a good barometer of our effort and success, and represent the highest attainment yet achieved by the Society. With respect to chapter visitations, all but seven chapters were visited during the past year by members of our national family.

Also, the various national committees held a total of 56 meetings and the elected officers met on five occasions. It is fitting that this successful year is culminated in the attainment of a 29,013 membership and the presentation of the largest Industrial Exposition in the Society's history.

★ ★ ★

Executive Secretary: The Society has had a healthy growth. It has prospered in every respect and there is no foreseeable reason why it should not continue to do so in the future. While our present headquarters are completely satisfactory, it is conceivable that any major expansion in the future might drastically change our present position. Possibly, a small research laboratory could implement our research program at some future date. Also, it might become desirable to have our headquarters located in a different area.

In the interest of the continued success of the Society, its operations should be reviewed carefully to assure maintaining close relationship between the chapters and the national organization by directing the activities of the national committees toward being of direct assistance to the chapters.

H. E. Conrad
Executive Secretary

Our new research program can and should implement every technical activity of the Society. As data become available from research projects, material for technical programs at national and chapter meetings will become a part of the technical literature developed by the Society and will provide information to our membership and to industry. This research work should strengthen the Society's position in educational institutions and should provide material for Society publications, develop public recognition and establish professional acceptance.

★ ★ ★

H. E. Collins
Treasurer

Treasurer: Net worth of the Society as shown in the Balance Sheet for January 31 (following page) compares favorably with that of $708,608.19 at the same time last year. Assets are unusually high, representing in part monies collected for the 1954 Industrial Exposition but these have been offset by entries under liabilities in the Balance sheet. These monies will be unencumbered once the Exposition has been completed.

Income budgets are generally being met as predicted by the National Finance Committee and the expenses of the Society's functional and technical activities are well within the allotted budgets.

Each member's share in the income and expense, accruing through the Society's operations, is graphically portrayed in the bar charts appearing below the Balance Sheet. Although the figures are shown on an average annual basis, they are computed over a two-year period in order to include the biennial Industrial Exposition. Average membership during this period was 24,798.

★ ★ ★

Assistant Secretary-Treasurer: The Society, like government and industry, is always faced with the problem of selecting its best qualified members to serve on its important committees. To assist in ob-

AMERICAN SOCIETY OF TOOL ENGINEERS
BALANCE SHEET
JANUARY 31, 1954

ASSETS

CURRENT ASSETS		
Cash on Hand and in Banks		$ 379,459.57
Accounts Receivable		18,116.64
United States and Canadian Bonds		302,998.12
Inventories		32,152.59
Treasury Bills		299,038.33
Total Current Assets		$1,031,765.25
FIXED ASSETS		
Land	$ 16,000.00	
Land Improvements	6,529.01	
Building	125,754.35	
Automobile	2,671.49	
Furniture and Fixtures	35,175.35	
Total Fixed Assets		$ 186,130.20
OTHER ASSETS		
Deposits with Others	$ 1,870.00	
Travel Advance	911.14	
Deferred Expense—Tool Show 1954	1,720.23	
Accrued Interest	3,838.00	
Total Other Assets		$ 8,339.37
Total Assets		1,226,234.82

LIABILITIES

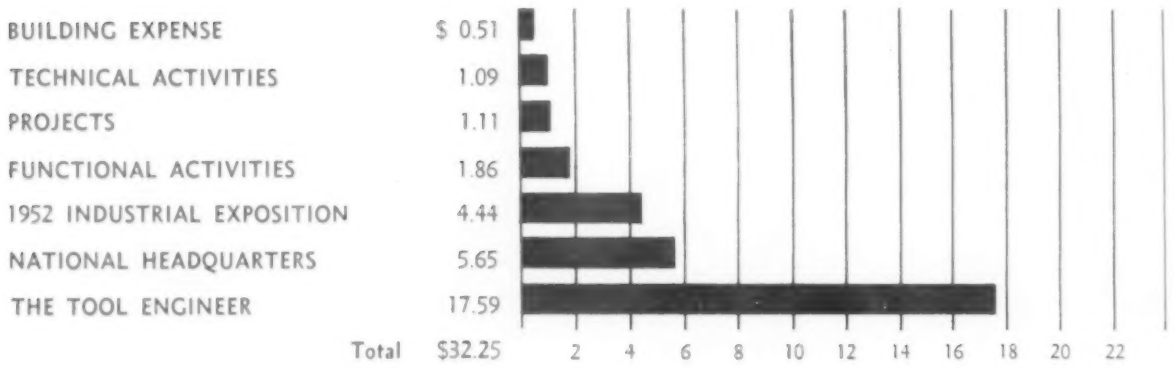
CURRENT LIABILITIES	
Accounts Payable Chapter	$ 6,745.30
Accounts Payable Membership Pending	4,149.00
Accounts Payable Trade	785.72
Accounts Payable Suspense	80.00
Accrued Agency Commissions	662.25
Prepaid Advertising	7,252.98
Awards Deposits	1,845.00
Accounts Payable McGraw-Hill	1,411.85
Deposits Received	165.00
Accrued Federal Old Age Benefits	520.01
Deposits—1954 Show Registration	10,775.00
Deposits—1954 Show Space	411,173.25
Total Current Liabilities	$ 445,565.36

NET WORTH

BALANCE OCTOBER 1, 1953	$ 774,191.79
EXCESS OF INCOME OVER EXPENSE	6,477.67
Total Liabilities and Net Worth	$1,226,234.82

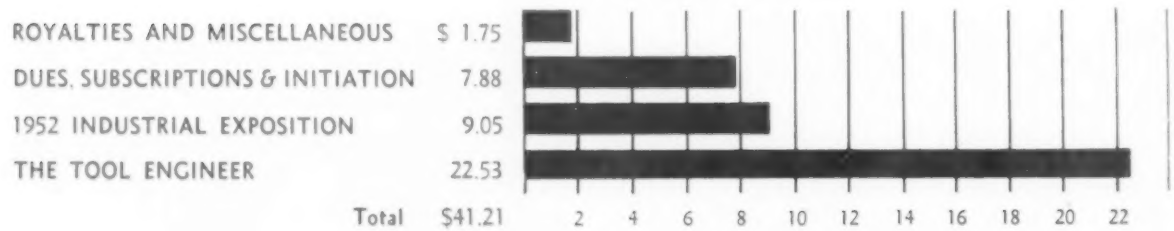
EXPENSES PER MEMBER PER YEAR*

(Based on fiscal years 1951-52 and 1952-53)



INCOME PER MEMBER PER YEAR*

(Based on fiscal years 1951-52 and 1952-53)



*Average membership during period was 24,798

Beyond obtaining invaluable technical information and advancing the profession of tool engineering, members of The American Society of Tool Engineers receive multiple dividends. This is graphically portrayed in the accompanying bar charts for income and expenses. A glance at these charts reveals each member's stake in his society. With an investment of $7.88, the average member has received services in various forms from the Society amounting to $32.25, a return of over 400 percent. With respect to Society income, his cash investment is multiplied 520 percent.

In the Balance Sheet at the top of this page are shown the assets, liabilities and net worth of the society. This portrays its strong financial structure, its net worth being approximately $¾ million.

ning qualified personnel for ese committees, the Assistant cretary-Treasurer is respon- le for maintaining a record available and qualified mem- ers for the benefit of officers nd committee chairmen. Mem- ers for this list must not only e capable but also have the ime and interest required for erving the Society. To assist in this operation, chapters are urged to submit recommendations and qualifications of members willing to accept the responsibility involved in committee appointments.

W. Ewing
Asst. Secretary-Treasurer

First Vice President: To coordinate the efforts of the many Society committees, a national officer is responsible for the operation of each. In this way, close liaison is maintained and each committee is represented at the policy making level of the Society. To further implement the committee operations, each national committee has its counterpart in a chapter committee so that the planning and work of the national committees can be utilized direct by the chapters. Also the chapter needs can be more effectively served by this duplication in organization. The committees immediately following are under the jurisdiction of the First Vice President and include: Program, Editorial, Education and Public Relations committees.

J. P. Crosby
First Vice President

Editorial: The National Editorial Committee, during the past year, has continued its study of THE TOOL ENGINEER magazine to improve its technical contents and refine the ASTE News section of the publication. In its program for developing technical information, the committee has appointed a staff of field editors. This new arrangement has already shown results in articles contributed to and published in the magazine.

J. L. Petz
Chairman, National Editorial Committee

To improve the Society news coverage and to recognize achievements of chapter editorial committee chairmen, a contest was held during the months of November, December and January. Twelve awards were made to the chapter editorial committee chairmen for the best news reports during this period. In addition to the regular information supplied to the chapters, the staff initiated a monthly newsletter wherein mutual problems are discussed and suggestions are made for improving news coverage. During the year, 648 reports from 103 chapters were received and published—a new high.

To appraise the effectiveness of THE TOOL ENGINEER and the special interests of the readers, the publication staff is retaining the services of an editorial research organization. This organization is making a continuing study on a three-month basis, evaluating the editorial content in order that steps may be taken to best serve the needs of the readers.

Indicative of the growth and prestige of the magazine, the average issue contained 276 pages during the past year (April to March). For the same period in the previous year, the average issue had 236 pages, an increase of almost 15 percent. Compared with the second year previous, the increase is 40 percent. The April 1954 issue, which is the Exposition and Convention issue, is the largest ever published by the Society. It contains 528 pages.

Public Relations: Since national public relations is being adequately handled by the Society's public relations counsel, the committee is directing its full efforts at the chapter level. Guidance of an organized and positive nature is becoming more and more necessary with the continued growth and status of the Society. Two separate but coordinated steps have been taken in this direction through the formation of an ASTE News Bureau and preparation of a chapter public relations kit.

E. H. Ruder
Chairman, National Public Relations Committee

The ASTE News Bureau, recently established as a function of THE TOOL ENGINEER, will assist the chapters by preparing local and house publication releases, will maintain its own mailing list and will act as an internal public relations counsel. In addition, it will handle certain national responsibilities.

Recognizing the need for a standard policy to guide chapters in interpreting ASTE to the general public, industry and its own members, the committee will issue the public relations kit to the incoming chapter relations chairmen. This kit will eventually be a complete guide for chapter public relations committees. Initially, however, it will define the responsibilities of the chapter public relations chairman, assist in making chapter operations representative of ASTE and contain a complete detailed guide to chapters in obtaining good local publicity.

The committee recognizes the need for supplying, to newspapers and other publications, information on accomplishments of individual members and on programs of the Society. In this way, prestige of the Society will be enhanced in the opinion of the public and will also make the individual member proud of his organization.

Education: This committee is being increasingly recognized as the educational spokesman for the tool engineering profession. The success of its activities proves that the profession is fundamentally necessary and an important part of the country's economic welfare.

A. R. Diamond
Chairman, National Education Committee

The committee has continued to spearhead action in a threefold program: (1) To aid in maintaining the supply of trained tool engineers; (2) to promote the most effective utilization of engineers in the national interest; and (3) to aid in establishing the importance of the tool engineering profession in the national economy.

On-Campus Conferences have been held at the University of Illinois and at the University of Wisconsin. Additional conferences are being planned for Michigan State College, Purdue University, University of Pennsylvania and Lehigh University. In addition to these, others are being planned at the University of Texas, M.I.T. and at either Illinois Institute of Technology or Northwestern University. The committee assists in the planning of this activity and it is expected that these conferences will grow in importance and become a major activity of the Society.

A new approach to college participation in industry education, the University of Pennsylvania Carbide Seminar is an outstanding educational attraction during the week of the ASTE Industrial Exposition in Philadelphia. Also, a Regional Educators' Conference is being held at the time of the show.

International education awards will be selected at the committee meeting in May. From the standpoint of professional recognition, this is one of the most effective methods of promoting the educational standards of the profession.

K. W. Riddle
Chairman, National Program Committee

Program: Planning for the 22nd Annual Convention in Philadelphia in concert with the Philadelphia Host Chapter Committee has resulted in an extensive and outstanding program. The program includes 30 technical sessions in which 40 papers and 5 panels on current engineering subjects are presented. Papers and transcripts are being made available to the membership either singly or in bound form as collected papers.

To make the meetings of vital interest to more members and industry, several new presentation methods for the technical papers are being used. These include the introduction of audience panels, "buzz groups," reactor panels, etc.

Revisions are in process for the next printing of the *Host Chapter Procedure Manual*. As in the past all suggestions of the present Host committees will be taken into consideration in making improvements and revisions to serve as a guide in planning future conventions.

Chapter use of the *ASTE Speakers and Film Directory* has been increasing steadily. This publication is now in process of being expanded and revised and will be mailed to incoming chapter program chairmen. About 100 additional names have been added to the current list of speakers in this useful directory.

Planned speaker tours, wherein chapters in an area schedule meetings so that a speaker can include the participating chapters in a circuit, have met with success. The experience gained from these tours has defined a need for expansion and development of this activity.

A second *Prepared Technical Program* on film is being prepared for chapter use. Because considerable interest has been aroused by the first film, the committee recommends authorization for its use outside ASTE membership, e.g., industrial training programs, cooperative educational groups, etc.

Second Vice President: Three committees are under the direct supervision of the Second Vice President. They include the important Constitution and By-Laws, Standards and Book committees. A good constitution and a suitable set of by-laws are vital to the healthy growth and operation of the Society. They must be constantly up-to-date and must keep pace with the needs and changes in the organization. Likewise, carefully planned standards that provide for standardization and yet allow for improvement and development are a necessity to a tool engineer. Within the past year the Book Committee has been added to the responsibilities of the Second Vice President, making the experience of the Standards Committee available for utilization in handbooks and other publications of the committee. Summaries of the activities of these committees follow.

H. B. Osborn, Jr.
Second Vice-Pres.

J. X. Ryneska
Chairman, National Constitution and By-Laws

Constitution and By-Laws: During the past year, revision of the *National* and *Chapter Procedures* have been completed and approved by the Board of Directors for printing and distribution. Also, nine amendments to the Constitution have been approved by membership ballot.

The new amendments involve qualifications for senior, affiliate and associate memberships; field of operation of the Research Fund; enlarged membership for the Board of Directors; requirements for amending the By-Laws and the Constitution; requirements for

presidency; election of president resulting from vacancy of office; and provisions for protecting the non-profit character of the Society.

The committee has also analyzed the operations of the Society committees and has made recommendations to the Board of Directors, clarifying or modifying the By-Laws to facilitate operations and define responsibilities.

G. F. Bryan
Chairman, National Standards Committee

Standards: A major activity of this committee is its *Data Sheet* program. Reprints of 130 *Data Sheets* are available to all new members and on special request. In March two new *Data Sheets* were mailed to the entire membership. Three other sets are in preparation and will be mailed at an early date. A new plan involves preparing of sets of *Data Sheets* on only one subject and mailing as complete packages to the membership.

The Society continues active participation on committees of the American Standards Association and is presently represented on ten committees. These include: ball and roller bearings; allowances and tolerances for cylindrical parts and limit gages; surface quality; classification of materials for tools, fixtures and gages; ASA Standards Council; and Mechanical Standards Board. It is also represented on a newly formed committee on industrial diamonds and accessories for their use. In addition to the activities of the ASA, the committee maintains membership in the name of the Society in the Canadian Standards Association.

Work of a subcommittee is progressing rapidly toward standardizing single-point carbide tools. When completed the material will be forwarded to ASA for approval as an American Standard. Also, to supplement the *ASTE Commodity Index*, a subcommittee is presently working on an index for classifying theory and practice material.

F. J. Sehn
Chairman, National Book Committee

Book: Many meetings have been held during the year chiefly for the benefit of the forthcoming *ASTE Die Design Handbook*. It is estimated that the handbook will be published early in 1955. Approximately 50,000 copies of the *Tool Engineers Handbook* have been sold and it is conservatively estimated that 75,000 copies will have been sold before the second edition is published.

The committee feels that Society papers should be published as bound transactions and that reports of various committees, official addresses, awards citations, and conference proceedings could well be added. Other bound technical publications and many other useful handbooks and manuals could be compiled on tool engineering subjects.

H. C. McMillen
Third Vice President

Third Vice President: Two committees report to the Third Vice President: Membership and Professional Engineering. The life blood of the Society is its membership. Maintaining the pace of growth and improving the professional status of the members are entrusted to these committees. The facts that the Society continues to be the fastest growing technical society in the world and that professional recognition is ever increasing testify how well these committees are performing. Brief reports for each committee follow.

A. B. Clark
Chairman, National Membership Committee

Membership: The Society membership reached a total of 29,013 on April 1. This represents a 14.5-percent gain in membership within a year, marking another new high for the Society. Also, during the past year, ten new chapters have been chartered; namely, Tucson, No. 106; Knoxville-Oakridge, No. 107; Chatauqua-Warren, No. 108; Lansing, No. 109; Canton, No. 110; Muskegon, No. 111; Calumet Area, No. 112; Merrimack Valley, No. 113; Hendrick Hudson, No. 114; Western Reserve, No. 115; and the first student chapter (temporary) in the history of the Society at the Universiy of Michigan.

Organizaion efforts are being made toward formation of chapters in Little Rock, Arkansas; San Antonio, Texas; Chattanooga, Tennessee; Battle Creek-Kalamazoo, Michigan; Keene, New Hampshire; East Texas; Mansfield, Ohio; Ashtabula, Ohio; Trenton, New Jersey; Ottawa, Canada; and New Bedford, Massachusetts.

The committee feels that a fertile field for potential members is technical university graduates. Therefore, everything that is done to interest students in becoming members of ASTE in a student chapter is extremely worthwhile.

L. E. Doyle
Chairman, National Professional Engr. Committee

Professional Engineering: Since the start of its present program in aiding members to achieve professional engineering registration, the committee has realized that it can best serve individual members through their chapters. For this reason, each chapter has been encouraged to set up a professional engineering committee. About 87 percent of the chapters have already appointed chairmen for their professional engineering committees and the objective of get-

ting 100-percent response is being pursued. As an indication of this vigorous program, 40 talks have been given and 37 articles published in chapter bulletins in 23 chapters.

As part of the effort to help the chapters, this committee has been issuing a regular bulletin. The purpose is to let the chapters know that the committee is working with them, offering suggestions and keeping them informed of current developments in the field. Two chapters are conducting courses of two or more years' duration in fundamental subjects for their members. Some states now include specific tool engineering questions in their examinations.

To broadcast its message as widely as possible, the committee has prepared an article on "The Tool Engineer and Professional Registration" which contains a chart showing the requirements for registration by states and provinces. The article explains briefly what registration is, emphasizes its advantages for tool engineers and points out the services offered by the Society. This article appears in the April issue of THE TOOL ENGINEER. Specific recognition of and registration in tool engineering is, of course, the ultimate to be desired.

special committees

H. D. Long
Chairman, National Finance Committee

Finance: This committee has reviewed and approved the Society audit for the year ending September 30, 1953. Also, the financial trends of assets, liabilities, reserves, income and expenses for the past ten years have been studied. This committee recommends that one-half the income from THE TOOL ENGINEER magazine be considered as normal income for budget planning and that the cash reserves currently held in checking accounts above twice the monthly expenditures plus project appropriations be invested in short term government securities. The committee has also reviewed the budgets for the first five months of the current fiscal year and found them generally within appropriations.

W. H. Smila
Chairman, Honor Awards and Judicial Committees

Honor Awards: This relatively new committee will be of great importance in providing for recognition of outstanding men in the field of tool engineering. Awards to members as well as nonmembers will be made in order to inspire high endeavor and recognize achievement.

Awards under consideration include suitable recognition for outstanding service to the Society; published literature, technical writings or oral presentations in the development and application in tool engineering; engineering genius in mechanical design, manufacturing techniques or production methods; advancements in the design of tooling; technological developments in the field of automation; educational services in tool engineering; and unusual skills in the field of management.

Judicial: The Judicial Committee, composed of nine past presidents, renders final decisions regarding interpretations of the Constitution and By-Laws when such interpretations are questioned. The committee held but one meeting during the past year to consider a tentative decision of the Board that there are no ex-officio members on the ASTE Research Fund Committee. It unanimously approved that decision. Only one meeting each year of this committee is anticipated unless there are unforeseen developments which necessitate the calling of special meetings.

Research: The Research Fund Committee has completed the preliminary or organizational phase of its activities and has established a firm basis for its future work. The final step in the organization was selecting and hiring its Research Director, Col. Leslie S. Fletcher.

R. B. Douglas
Chairman, National Research Fund Committee

A number of suggested projects for research have been recommended to the committee. These have originated with laboratories, commercial organizations, research institutes, universities and individuals. In some cases the suggestions carried with them an offer to share the cost of the research work. Work has been started on three of these projects and it is expected that contracts for them will be placed in the near future. The committee is looking forward confidently to an expanding volume of sponsored research work in the tool engineering field.

conclusion

The achievements recorded in this report pay tribute to the solid foundation upon which the Society is founded. Your Society is healthy, vigorous and growing, and its progress during the past year has been gratifying. The Board of Directors acknowledges the Society's debt to the many national and chapter officers, committee members and all others who have contributed time and talent in building a greater Society that it may better serve industry and the public.

Submitted for and on behalf of the
Board of Directors and National Officers

President and Chairman of the Board

How[illegible]d C. McMillen Con[illegible]cts Installation

Lim[illegible] At a meeting held March 18, ASTE [illegible]hird vice president for 1953-54, H[illegible]ard C. McMillen, conducted Lima [illegible]apter's installation of officers. Mr. M[illegible]Millen complimented the chapter on [illegible]he leadership and progress it has m[illegible]e since its chartering only two years [illegible]o. He also congratulated Vince Spahr [illegible]n the work done by the ASTE National Constitution and By-Laws Committee.

1954-55 Chapter Officers

Lima officers for the coming year are: chairman—Robert E. Fromson; first vice chairman—H. W. Carey; second vice chairman—W. J. James; secretary—John E. Kuck; and treasurer—William E. Epley.

A letter from Joseph L. Petz, chairman of the National Editorial Committee, complimenting Donald H. Cox for his achievements as editorial chairman, was read by Mr. McMillen. Mr. Cox was one of the winners in the contest for chapter news coverage staged recently by the National Editorial Committee. He also received a copy of the *Tool Engineers Handbook*.

The technical program was presented by A. O. Schmidt, research engineer, Kearney & Trecker Corp., Milwaukee, Wis. He spoke on modern metal-cutting principles and applications.

Committee chairmen serving the Lima chapter this year are: program—Gene Siferd; membership—J. B. Walsh, Jr.; public relations—C. N. Sterrett; editorial—Donald Cox; education—B. C. Schwertfager; constitution and by-laws—Jim Linhart; standards—Vince Spahr; professional engineering—Eugene Wagner; financial—R. W. Arlin; advertising—W. E. Waters; welfare—C. F. Davis; and special activities—Ralph Mercer.

Members Present Program

Program speakers at the chapter's February meeting were two of its own members, B. C. Schwertfager and Eugene R. Wagner. Mr. Schwertfager described a new large roll lathe which he inspected on his recent trip to Europe, using slides for illustration. Mr. Wagner, manufacturing section engineer, Westinghouse Electric Corp., provided the commentary for film slides of the ASTE headquarters prepared program on "The Forces of Single-Point Metal-Cutting."

Frank M. Park, design engineer, Stirne Tool Co., showed a thirty-minute film on manufacture and use of aluminum.

—Donald Cox

Sworn into office at Toronto chapter's March installation were: Len Chapman, third vice chairman; Cliff Farr, chairman; Eric Brown, treasurer; David Few, national delegate; Willard Smith, secretary; and Bruce Fairgrieve, first vice chairman. Not pictured is W. H. Weatherhead, second vice chairman.

A. B. Clark Installs Toronto Officers

Toronto—New officers of Toronto chapter were installed March 3 by Andy Clark, chairman of the National Membership Committee. After the ceremonies, a technical session featured a talk by J. B. Riley, general sales manager, American Sip Corp., New York. He spoke on the "Evolution of Industrial Metrology."

At the chapter's February session a crowd of 200 heard Warren L. Turner, development engineer with Cincinnati Milling Machine Co. He spoke on milling practices and techniques. Illustrating his talk with slow-motion films, Mr. Turner showed the effect of rake angles and speeds on tool life.

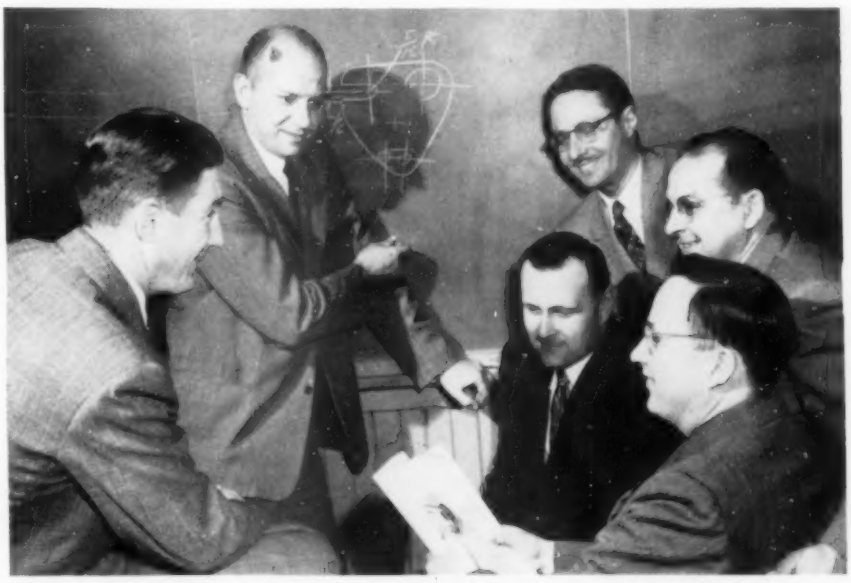
—A. McKinney Rice

Glen Moore Addresses Peoria Meeting

Peoria—Mecca Supper Club was the setting for the March dinner meeting of the Peoria chapter. Attendance was small due to an unscheduled snow storm. Speaker for the evening was Glenn C. Moore, Heald Machine Co., Worcester, Mass., who discussed precision finishing equipment. Technical chairman for the evening's program was Otha Gammon.

Serving on the chapter's executive committee this year are: Edward Weber, Harold Austin, Charles Tobin, Walter Bristow, Russ Saurs, Harold D. Baker, Kenneth C. Koch, Earl Clancy, James Baker, Joseph P. Little, Jr., O. O. Gammon, Judson Lindsey, Arthur Francois, and Wesley C. Leveck.

—Russ Saurs



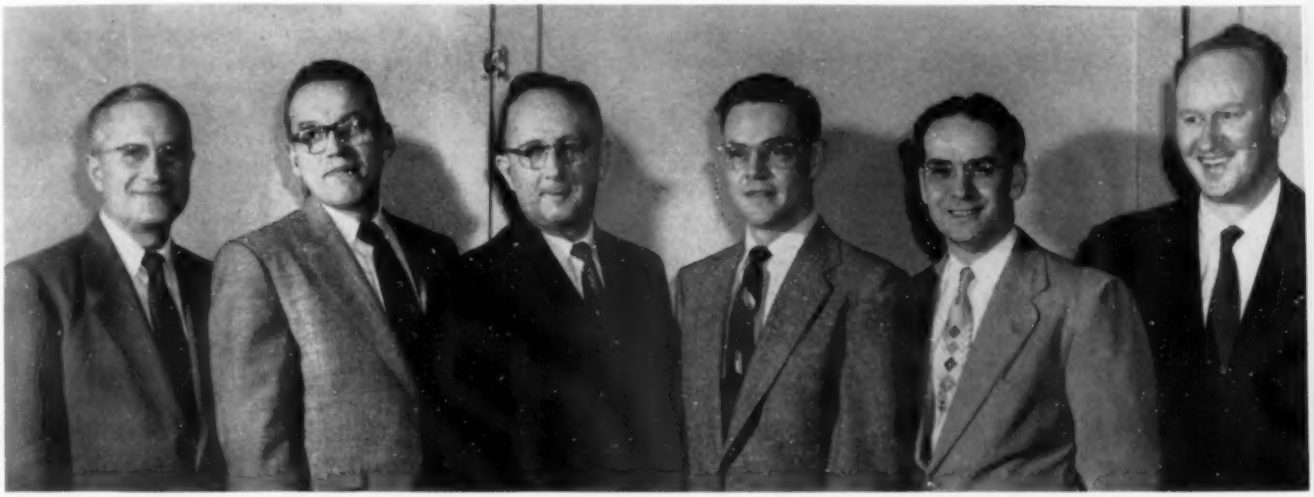
Peoria officers for the coming year, from left are: William A. Bahnfleth, Jr., treasurer; Victor W. Schellschmidt, chairman; Ray J. Zimmerman, delegate; Wilbur McWilliams, first vice chairman; Walter W. Ballard, second vice chairman; and Leo Johnson, secretary.

new officers fill chapter posts

Roger F. Waindle, 1953-54 ASTE national president, installs John Beck, chairman of the Chicago chapter in ceremonies at the Keyman's Club, Chicago.

Ready to take on official responsibilities for the Milwaukee chapter are: from left, Robert E. Bodendoerfer, chairman; Steve Pohlhammer, first vice chairman; Ralph Lund, second vice chairman; Hans G. Frommer, secretary; and George L. Riordan, treasurer.

Confidential smiles crease the faces of the new officers of Golden Gate chapter. They are: L. Dean Rouland, chairman; Vernon Gallichotte, first vice chairman; Phillip R. Freeman, secretary; William G. Burge, treasurer; David A. Gustafson, past chairman; and Ted N. Lindquist, second vice chairman. *—Phillip R. Freeman*



Howard C. McMillen, left, third vice president and a national director of ASTE for the 1953-54 term, lines up with the officers of Muncie chapter whom he has just installed. They are: from left, Carl Darger, chairman; Vynul Eley, first vice chairman; Emmet Blocher, secretary; N. Francis Wilson, treasurer; and Don C. Wedlick, second vice chairman. Speaker on the evening program was E. V. Sharpnack, Sr., of Reynolds Metal Co. *—Don C. Wedlick*

Hartford officers who will assume duties for the 1954-55 term are: seated, Henry J. Gotta, vice chairman; Robert L. Gay, chairman; and Joseph J. Balciunas, vice chairman. Standing are: Paul Erik Dillberg, treasurer; and Harry A. Anderson, secretary.

These new Windsor chapter officers are already discussing a proposed membership drive. Shown are: Jack Johnson, past chairman; Frank A. Ritchie, chairman; Sid Oliver, first vice chairman; and Ross Goulin, secretary of the chapter.

Officers serving the Montreal chapter this year are: J. Dodge, treasurer; C. Grinstead, secretary; T. Nashman, third vice chairman; J. H. Currie, second vice chairman; T. C. Hill, chapter chairman. Not pictured is T. Tracy, first vice chairman.

Los Alamos chapter's installation was conducted by Leslie Seager, member of the National Professional Engineering Committee. Shown at the meeting are, from left: Robert Kee, second vice chairman; Gordon Anderson, secretary; Joseph Bourne, first vice chairman; Herman Von Steeg, chairman; Gerald Rogers, treasurer; Mr. Seager, and Robert Moeller, national delegates. The ceremonies took place March 13 at a dinner dance held at the Los Alamos Civic Club.

—Basil Boss

National Treasurer H. E. Collins congratulates Jimmie E. Franklin, newly installed chairman of the North Texas chapter. Other officers shown, from left, are: James W. Brown, treasurer; F. Paul Simpson, secretary; B. B. Parker, second vice chairman; John C. O'Connor, first vice chairman. The outstanding service pin went to F. N. LaMartine. Technical speaker was Daniel P. Green, assistant supervisor of tool development, Haliburton Oil Well Cementing Co., Duncan, Okla.—*F. Paul Simpson*

ASTE Past President Installs Montreal Officers

Montreal—Society Past President Robert B. Douglas installed the officers of the Montreal chapter in ceremonies at Montreal Technical School on March 11.

In addition, committee chairmen were announced. They are: program—T. Nashman; membership—F. Winkworth; editorial—F. C. Henderson; constitution and by-laws—M. Masse; public relations—G. Henderson; education—L. Poirier; standards—K. Fortune; and registration—G. Walker.

Mr. Douglas then introduced Mr. Chambers who talked on "Heat Treatment of Steels." Mr. Chambers is affiliated with Atlas Steels, Ltd., of Welland.

On March 18 a plant tour was made by the chapter. Approximately 125 members and guests toured Electrolux plant in Montreal. The group was guided through the various operations of the plant and gathered in the dining room for refreshments and a few words from Russell Grawl, company president. *—F. C. Henderson*

Louis Joliet Doubles Membership in One Year

Joliet, Ill.—In his annual report delivered at the March installation meeting of the Louis Joliet chapter, Retiring Chairman H. J. Moffatt emphasized the chapter's rapid growth since its chartering a year ago and reported that membership has more than doubled—from 80 charter members to 167.

A highlight of the evening was the swearing in of chapter officers by H. Dale Long, president of Scully-Jones & Co. and chairman of the ASTE National Finance Committee. Also taking office at the meeting were the committee chairmen for 1954-55. They include: constitution and by-laws—John Ingersoll; membership—Leo Wolf; education—Clifford Berglund; editorial—Lionell H. Rohman; standards—Robert Heinz; program—Don Stanfield; public relations—Ken Hanks; professional engineering—Robert Mayer. Mr. Mayer is also historian.

In his address, Mr. Long stressed the responsibilities of the tool engineer to give the consumer better made goods at a lower cost. He also compared the responsibilities of the new officers with those of a crew on an airplane, saying that the officers must be the controlling and guiding body of the chapter.

The pin for outstanding service to the chapter was presented to Harry Frier.

—Lionell H. Rohman

At the installation of La Crosse ASTE officers, Fred Kessenich, far right, congratulates Allen Charley, incoming chapter treasurer. Other officers, from left, are: E. Ted Neubauer, second vice chairman; Robert Phillips, first vice chairman; Wesley Bertelson, chairman; and Jerold Hopkins, secretary. Mr. Kessenich is a past chairman of the Madison chapter.

Installation Night Held by La Crosse ASTE Chapter

The combination of Installation Night and a talk by Jerry R. Reinertson on "Pivot Punches & Dies" made the La Crosse chapter's March 23 meeting one of its most outstanding of the season.

Installed as officers for the 1954-55 term of activities were: chairman—Wesley Bertelson; first vice chairman—Robert Phillips; second vice chairman—E. Ned Neubauer; secretary—Jerold W. Hopkins; and treasurer—Allen Charley. Installation was conducted by Fred Kessenich, past chairman of the Madison chapter. Chairman Phillips was named national delegate and Norman Jacobson was elected alternate.

Newly installed Chairman Phillips presented Ed Giroux, retiring chairman, with the past chairman's pin; and Fritz Horak received the service award.

Mr. Reinertson, mid-west manager of Pivot Punch & Die Corp., Chicago, carried the technical part of the program. He illustrated and explained how metal and plastic parts could be processed better and more economically.

The February 23 meeting of the chapter was at the Trane Co. in La Crosse. Elections were held and the technical session featured a talk on the effect of cutting oil additives. The speaker was Herman J. Brenneke, engineer at Socony Vacuum Oil Co., Wadham's Division.

—Ed Giroux and Fritz Horak

Pittsburgh Award Given to Edward S. Phillips

Pittsburgh—Edward S. Phillips, newly installed second vice chairman of the Pittsburgh chapter, received the outstanding service award at Pittsburgh's March meeting. After the installation of officers, a complete set of golf clubs was presented to J. L. Brozek, retiring chapter chairman, in appreciation of his fine work.

L. D. Richardson, regional manager of Eutectic Welding Alloys Corp., was the program speaker. *—E. L. Caughey*

Joseph Maezer Heads Cincinnati Officers

Cincinnati—March 9th was installation night for the officers of the Cincinnati chapter. George Simon administered the oath of office in the ceremonies. Joseph Maezer is the chairman for the 1954-55 term.

Richard Niebusch, retiring chapter chairman, gave a farewell address, thanking the officers, committeemen, and members who helped to make the year a successful one. He awarded the Chairman's Service Pin to W. J. Fredericks.

Phillip C. Satterthwaite, factory manager at Cogsdill Twist Drill Co., in Detroit, was the guest technical speaker. He addressed the group on "Drills—Their Use and Abuse."

—Frank H. Houston

McClellan Appointed Sales Manager

William B. McClellan, a past national director of ASTE and long active in Society activities, has been appointed to the position of sales manager of the Gairing Tool Co., according to an announcement by Eugene Bemb, company president. Mr. McClellan, ASTE national secretary for two years, was formerly Division Manager of Machine Applications.

B. O'Meara was named to the office of executive vice president.

Pictured at the February meeting of the South Bend chapter were: from left, E. James Nelson, secretary; Richard C. Wachs, program chairman; George Lieser, technical speaker; and James E. Kemp, chairman. Mr. Lieser of American Wheelabrator and Equipment Co., Mishawaka, Ind., spoke on "The Advantages of New Liquamatte Cleaning Process."

Toledo chapter's February meeting featured a talk by E. V. Crane of the E. W. Bliss Co., Toledo, on "Automatic Presses and Tooling." From left are: Mr. Crane; Norman Kirk, vice president of E. W. Bliss Co. presenting the scholarship award to Philip W. Morlan; and Joseph Kertz, chairman of the Toledo chapter.

ASTE's 1953-54 president, Roger F. Waindle, installs new officers of the Mid-Hudson chapter. Taking the oath of office: Henry J. Tesmer, chairman; Richard Fitzgibbons, first vice chairman; Frank N. Plotnik, second vice chairman; William F. Shapmyer, secretary; and J. Harry Keller, treasurer.

Ed Dickett, member of the National Editorial Committee for 1953-54, was the installing officer at the March meeting of the Fox River Valley chapter. An award for outstanding service was presented to Fred Porter, membership chairman. Shown here, from left: Donald E. Zierk, chairman; W. C. Perkins, first vice chairman; Robert J. Evans, second vice chairman; Charles A. Olson, secretary; Harold L. Smith, treasurer; and Philip C. Shaner, delegate.—*W. C. Perkin*

Ben Hazewinkel, far left, national director of ASTE, was the officiating officer at the San Gabriel installation. With him are: Irving Greensides, chairman; Ed Cutler, first vice chairman; Clarence La Course, second vice chairman; A. L. Spaulding, secretary; Lincoln Mager, treasurer; and Peter Carter, national delegate.—*J. S. Wajdik*

Richard Niebusch, past chairman and now national delegate, congratulates Joseph C. Maezer, the new chairman of the Cincinnati chapter, after the installation ceremonies. Other 1954-55 officers are, from left to right: John H. Elfring, first vice chairman; Dr. Max Kronenberg, second vice chairman; Moler Duff, Jr., secretary; and Julius Steinhoff, treasurer.

ASTE President Installs Mid-Hudson Officers

Poughkeepsie, N. Y.—More than 200 members and guests of Mid-Hudson chapter attended the seventh annual ladies night program and installation of officers, held at Germania Hall on March 20.

Featured speaker and installing officer was Roger F. Waindle, 1953-54 national ASTE president. In his talk on "The Economics of Tool Engineering," he cited the economic conditions which he has found to prevail in the tool industry in his travels throughout the country, also explaining the new amortization program under which the government will soon allow industry to operate.

Other members of the national organization were on hand for the meeting. Present were: Richard A. Smith, a 1953-54 national director; Joseph L. Petz, chairman of the National Editorial Committee; and William W. Schug, area captain of the National Membership Committee. Mr. Petz and Mr. Schug are charter members of the Mid-Hudson chapter.

Committee chairman were appointed as follows: Warren Watkins, membership; Chris J. Noll, Jr., professional engineering; George L. Clegg, program; Davis Gale, editorial and public relations; Andrew Pryde, dinners and entertainment; C. Morgan Newbury, education; Walter A. Stadtler, standards; Attila C. De Illy, constitution and by-laws; Lloyd C. Bigelow, finance; and Joseph L. Petz, historian.

The service pin was awarded to Edward W. Nielson for outstanding services rendered to his chapter during the year.

Four executives received affiliate membership plaques on behalf of their companies. Plaques went to James F. Brehm, president, Daystrom Electric Corp.; Ralph E. Williams, assistant works manager, The DeLaval Separator Co.; Kenneth L. Snover, assistant general manager, International Business Machine Corp.; and Henry C. Scholer, president, Modern Design, Div. of H. C. Schoebler, Inc. —*Davis Gale*

Boston officers were installed by Joseph P. Crosby, far right, first vice president for 1953-54. Shown with him are Frank D. Clark, treasurer; Robert H. Marsh, secretary; Thomas B. Welsh, second vice chairman; Charles L. Sadon, first vice chairman; and Karl Nowak, chairman. The service award went to Robert H. Kean.—*Harry Midgley*

Howard D. Bertholf, retiring chairman, swears in Binghamton's new officers. From left: D. O. Williams, chairman; Wendell Harper, second vice chairman; Andrew Komar, secretary; and Charles King, treasurer. Phillip M. Taylor, not in picture, is first vice chairman.

Members of the National Standards Committee met recently with the Rockford chapter and toured the J. L. Clark Mfg. Co. Shown here with Ralph Rosecrance, center, president of the firm, are: Stan Girard of *The Tool Engineer* staff; Assistant Executive Secretary Allen Ray Putnam, Clyde Fanning, William Moreland, Mr. Rosecrance, Past President L. B. Bellamy, National Secretary R. C. W. Peterson, John Rotchford and Standards Chairman George Bryan.

Program speaker at a recent meeting of the Evansville chapter was Jack T. Welch, Sheffield Corp. Shown examining a couple of display items are Rex Welbaum, left, program chairman for the evening, and John Race, then second vice chairman of the Evansville chapter.

St. Louis Presents $200 Scholarship Award

St. Louis—March 4 was a big day for all St. Louis ASTE members. ASTE President Roger F. Waindle installed the new officers at the annual executives' night dinner meeting; a $200 award was presented to a student at Cincinnati University; Dean Bursick of the university staff spoke on tool engineering education; Past President J. J. Demuth addressed the chapter on the Industrial Exposition; a talk on engineering training programs was presented by the Honorable Douglas R. Springfellow, congressman from Utah; and Retiring Chairman Willis Potthoff spoke on the topic "Advancement of ASTE."

St. Louis chapter's retiring chairman, Willis J. Potthoff, left, and Clarence Hall, second vice chairman, are about to exchange gavels at the installation.

Recipient of the scholarship award was Richard Bueler, who 'co-ops' at Wagner Electric Co. in St. Louis. It was presented by Roy Kallemeier who also discussed the merits of the co-op plan.

Dean Bursick told how ASTE provides help in supporting a broad tool engineering program in America, emphasizing the importance of training tool engineers to keep pace with Russian development of tool engineering.

President Waindle, before swearing in the officers, discussed the purposes and goals of the Society. Congressman Springfellow spoke on the responsibilities of being an American.

—John B. Brnjac

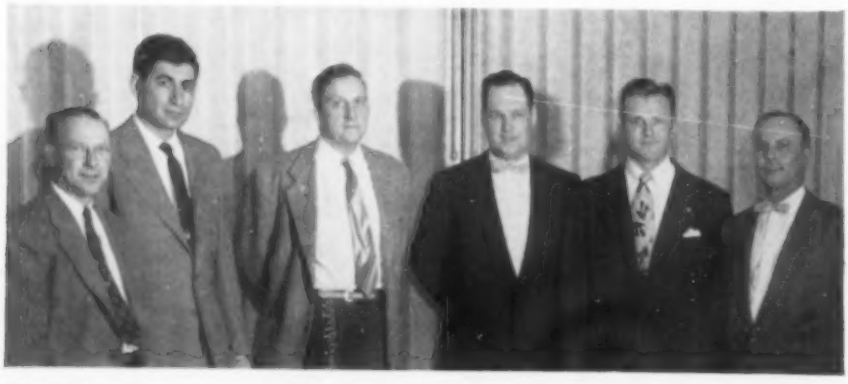
New officers of the St. Louis ASTE chapter were installed by Roger F. Waindle, left, national president for 1953-54. From left are: Vincent Bene, treasurer; Clifford Becker, secretary; Clarence Hall, second vice chairman; Harold Zimmerman, first vice chairman; Irwin Schumaier, chapter chairman.

New Officers Installed at Milwaukee Meeting

Milwaukee—Robert E. Bodendoerfer was installed as chairman of the Milwaukee ASTE chapter at a meeting held March 11. The ceremonies were conducted by Paul Butzin, past chairman, who presented the gavel to Mr. Bodendoerfer as a symbol of his responsibilities for the coming year.

A coffee talk on the Milwaukee expressway system was made by W. H. Tacke who described the plans for the new express highway being proposed for the city. The technical program was presented by George L. Boehm, chief sales engineer, industrial products department, S. C. Johnson & Son, Inc., Racine.

—Walter Behrend



Memphis officers were installed on March 12 at ceremonies held at the Claridge Hotel. Sworn into office were, from left: Tom Crofoot, first vice chairman; Natham Tamm, treasurer; Ben Shelton, second vice chairman; Bob Galloway, secretary; Bill Roth, chairman; and Al Hicks, retiring chairman and national delegate. Technical speaker was Earl Dougherty of Whitman and Barnes who gave a talk on drill and reamer applications.—*Frank Fly*

Toledo Celebrates 17th Anniversary

Toledo—On March 10 members of the Toledo chapter gathered at the Hotel Secor ballroom to observe their 17th anniversary and to install their newly elected officers. Among the honored guests invited to participate in the celebration were L. B. Bellamy and H. L. Tigges, past presidents. Judge Harvey G. Straub once again served as toastmaster.

The chairman's award pin was given to Harold F. Mohney for his diligent work during the past year.

The speaker for the technical program was Steve Hiltebrandt of Michigan Molded Plastics Co., who covered the history of the fabulous rise of the plastics industry and exhibited samples of many plastic products.

The highlight of the chapter's February meeting was the awarding of the annual $200-scholarship to an outstanding student at the University of Toledo. This year's recipient was Philip W. Morlan who received his scholarship from Norman Kirk, vice president of the E. W. Bliss Co.

The scholarship is based on academic standings, financial need, interest in tool engineering and extracurricular activities.

Technical speaker at the meeting was E. V. Crane of the Bliss Co. His topic was "Automat Presses and Tooling."

—Carl W. Hoglund and James Sullivan

Heads Tool Design at IBM's Endicott Plant

ASTE Member John A. Maruca has been appointed manager of the tool design department at IBM's Endicott, New York plant. Associated with IBM for the past 20 years, Mr. Maruca joined the company as an apprentice toolmaker, was later assigned to the toolroom, and has been a tool designer since 1946.

Wichita Panel Features "Major Assembly Tooling"

Wichita—In addition to the installation of officers at Wichita's March meeting the program also called for a panel discussion on "Major Assembly Tooling" and the presentation of three awards to Ted Young for his outstanding service in the past year in obtaining the largest number of new members.

Panel participants were: Ed Burhurst, senior tool engineer, Boeing Airplane Co., who discussed history of aircraft tooling; Ted Mueller, tool engineer, Beech Aircraft Co., who spoke on design criteria of major assembly tooling; Don Hansen, general supervisor of tool design at Boeing, who talked on structure design utilizing preformed concrete major jigs; Claude Lockert, tool engineer, Cessna Aircraft Co., who discussed structure design and the use of component assembly methods; and L. C. Bohannon, tool engineer, Beech, who spoke on steel structure methods. —*John G. Temple*

George West Receives Fond du Lac Award

Fond du Lac—Guest of honor at the March 12 installation meeting of the Fond du Lac chapter was Joseph P. Crosby, national first vice president for 1953-54, who conducted the installation ceremonies. The meeting was held at Oshkosh.

Retiring Chairman E. J. Kaiser was presented the past chairman's pin and George E. West received the service award for his outstanding service for the chapter during 1953.

After the installation, a film was shown illustrating the technical testing details and certain methods used in the construction of supersonic airplanes. The program was arranged by Charles Billberg.

—*Robert W. Hanson*

Sahlin Engineering Co. Appoints M. M. Clemons

Maurice M. Clemons has been appointed chief engineer of Sahlin Engineering Co., Birmingham, Mich., manufacturers of Iron Hands and other automation equipment. Previously, Mr. Clemons was associated with General Motors Corp. for 25 years, most recently as master mechanic of the Chevrolet-Cleveland Press Metal Div. A member of ASTE's National Book Committee, he served as a chairman of the Joint Industry Conference for Punch Press Standardization in 1953. He is a graduate of General Motors Institute and a registered professional engineer.

New Wichita officers pictured with Retiring Chairman A. A. Reddy, second from left, are: Harold Schowalter, treasurer; Paul Hess, secretary; Norman Watkins, third vice chairman; James Janson, first vice chairman; and R. O. White, chairman. Not shown is Walter Burnham, second vice chairman.

New officers of the Springfield, Ill., chapter were installed in ceremonies at The Mill. From left to right, are: Willis G. Ehrhardt, a national director and the installing officer; Paul Dirksen, secretary; LeRoy Rasch, new chairman; Merle Bergeson, treasurer; Charles Woodcock, first vice chairman; Earl Kane, past chairman; and Robert Waters, second vice chairman. Stewart Fletcher, chief metallurgist, Latrobe Steel Co., Melrose Park, Ill., was the speaker on the program.—*Charles Collier.*

At a dinner dance held March 3, new officers of the Kansas City chapter were sworn in by A. J. Mirick. More than 450 persons attended the event. Pictured here, from left, are: Maurice E. Manning, secretary; Winton D. Jenson, second vice chairman; Harold W. Buddenbohm, chairman; Ralph E. Adkins, treasurer; and Gary J. Schroer, first vice chairman.—*Richard W. Corliss*

Being sworn into office at the Albuquerque installation are: Larry Lowe, treasurer; Bob Sullenberger, secretary; Bill Porter, second vice chairman; Joe Moody, first vice chairman; Fred Deiber, chairman. Installing officer is Jerrie Durrie.

Pittsburgh's retiring chairman, L. J. Brozek, left, installs 1954-55 officers at the March meeting. Pictured are: Elwood Weissert, chairman; Paul H. Magnus II, first vice chairman; Edward S. Phillips, second vice chairman; G. C. Long, treasurer; and H. W. Bray, secretary.

Dr. Harry B. Osborn, Jr., ASTE second vice president for 1953-54, third from right, presents the Rockford chapter gavel to Chairman Robert Spengler. Others shown, from left, are: Alfred N. Oman, first vice chairman; Walter Fraser, third vice chairman; Marshall Samuelson, treasurer; Ernst Norman, secretary; and Joel Jannenga, second vice chairman.

ASTE president for 1953-54, Roger F. Waindle, left, visited the Santa Clara Valley chapter in March to officiate at the installation ceremonies. With him are: Frank Menard, first vice chairman; Jack McCarthy, chairman; Bill Wright, secretary; John Groves, treasurer; and Frank Cavanaugh, second vice chairman.

Leslie Seager Guest at Albuquerque Meeting

Albuquerque—Leslie Seager, member of the National Professional Engineering Committee and president of the Utah Engineering Council, was a special guest at the March 11 meeting of Albuquerque chapter. The thirty members who turned out braved a howling dust storm to attend the event at Leonard's Restaurant.

It was installation night and Past Chairman Jerome Durrie officiated at the ceremonies. H. R. Hanen received the chairman's award pin for outstanding service to the chapter.

Entertainment was on the evening's agenda when William Jenkins of Sandia Corp., Albuquerque, did some feats of prestidigitation and motion pictures of the 1953 500-mile Indianapolis race were shown.

The February 9 meeting was election night. Technical speaker was Ray H. Osbrink, president, R. H. Osbrink Mfg. Co., in Los Angeles. He described the technique of precision sand casting as developed by him in which tolerances and finishes equivalent to permanent mold castings are maintained.

—H. E. Anderson

Roger Waindle Installs Santa Clara Officers

Palo Alto, Calif.—Roger F. Waindle, 1953-54 national ASTE president, was a special guest at the March 16 meeting of the Santa Clara Valley chapter held at Rickey's. It was installation night and Mr. Waindle swore in the officers who will lead the chapter in their activities for the 1954-55 term. Ben Hazewinkel, a 1953-54 national director of ASTE of the Los Angeles chapter was also on hand for the meeting.

John Groves, newly elected treasurer, received the service pin for his outstanding work on the program committee for the past year.

Charles A. Lockwood, retired vice admiral of the United States Navy, was guest speaker on the evening program. He talked about "Submarines of the U. S. Navy," particularly the miniature subs for one, two, or three men used in World War II. He also had many interesting personal experiences to relate.

The coffee speaker was Dr. George Leonard Sullivan, member and past president of the California State Board of Registration for Professional Engineers.

—Bud Weaver

South Bend officers received the congratulations of Howard C. McMillen, national third vice president of ASTE for 1953-54. From left: Matthew J. Nowak, treasurer; John D. Cook, secretary; E. James Nelson, second vice chairman; John R. Berker, first vice chairman; Harold Housewerth, chairman; and Mr. McMillen. The outstanding service award went to Richard Spotts, the membership award to Wilson A. Lunch, and the guest award to Gordon Kirkland. Technical speaker was Albert Schreiber, assistant plant engineer, Dodge Mfg. Corp., Mishawaka, Ind.
—C. David Herring

Long Island Holds Panel Discussion

Another of a series of panel discussions was held by the Long Island chapter at the Long Island Agricultural and Technical Institute on March 22. The question before the panel was "Where Tool Engineering Fits in the Organization."

The moderator was Herbert Murphy, manager of the planning department at Grumman Aircraft. Panelists were Arthur Cervenka, past chairman of the chapter and assistant chief tool engineer at Grumman; Adolph Kastelowitz, chief tool engineer at Republic Aviation; Val Kiefer, assistant wing shop manager at Liberty Products; Otto Leutz, director of planning, Fairchild Camera & Instrument; Henry Maehl, manager of production engineering, Fairchild Engine; and Carl Dinglestadt, products methods engineer at Sperry Gyroscope.

Dr. Osborn Officiates

The March 8 meeting was Installation Night, at the Garden City Hotel. Dr. Harry B. Osborn, Jr., second vice president of ASTE and technical director of Tocco Div. of the Ohio Crankshaft Co., Cleveland, installed the officers and talked on 'Tooling for Induction Heating" on the technical program.

John Zockoff received the service award and Sara T. Moxley was presented with a Tool Engineers Handbook, an award of the National Editorial Committee for best and most complete coverage of chapter news for THE TOOL ENGINEER over a three-month period. *—Jerome Barfus*

George C. Bennett, new chairman of the Long Island chapter, is presented the chairman's pin by Dr. Harry B. Osborn, Jr., second vice president of ASTE, who was the installing officer.

Retiring Long Island Chairman Arthur Cervenka presents Mrs. Sara T. Moxley with a *Tool Engineers Handbook* for her outstanding new coverage as editorial chairman for the past year. The award is from the National Editorial Committee.

H. C. McMillen Conducts Fort Wayne Installation

Fort Wayne—Howard C. McMillen, third vice president of ASTE for 1953-54, was special guest of the Fort Wayne chapter at their March 10 installation meeting.

Mr. McMillen also awarded the past chairman's pin to Donald Welbaum, the retiring chairman.

Chairman Welbaum gave the annual report and awarded Blaine Garard the annual service award pin for his outstanding work in the past year.

Newly installed Chairman Haugk announced the committee chairman appointments. They are: membership, Alfred E. Peterson; editorial, Robert H. Bienz; public relations, John B. Thimlar; industrial relations, Dave A. Chambers; constitution and by-laws; James J. Smetana; standards, Frank J. Manning; education, David Allen Bauer; welfare, Eugene J. Gildea, Jr.; professional engineering, Harry A. Hartman; and advisory, Donald Welbaum.

Ed Flook, sales representative for NATCO, was the guest technical speaker. Ted Opel, chief electrical engineer, and Richard Brangan, advertising manager, assisted in the program.
—Alfred E. Peterson

Newspaper Publicizes Albuquerque Chapter

Albuquerque—In a featured article published in the "Sandia Lab News," internal house organ of the Sandia Corp., the Albuquerque chapter of ASTE received extensive coverage of its history and current activities. Considerable space was also devoted to the definition of tool engineering and an outline of the philosophy in back of the Society.

Much credit for the formation of the Albuquerque chapter was given to Gary Heckman, a charter member of the Cincinnati chapter and one of the principal organizers of the Albuquerque group. Largely through his efforts, the organization became a branch of the Denver chapter in 1949 and received its own charter in August, 1951.

A series of four photographs illustrating the Sandia Lab News story shows four phases of tool engineering in action. Members pictured were: John Risly, Jack Hammerstran, Herbert E. Anderson and Anthony Sullivan.

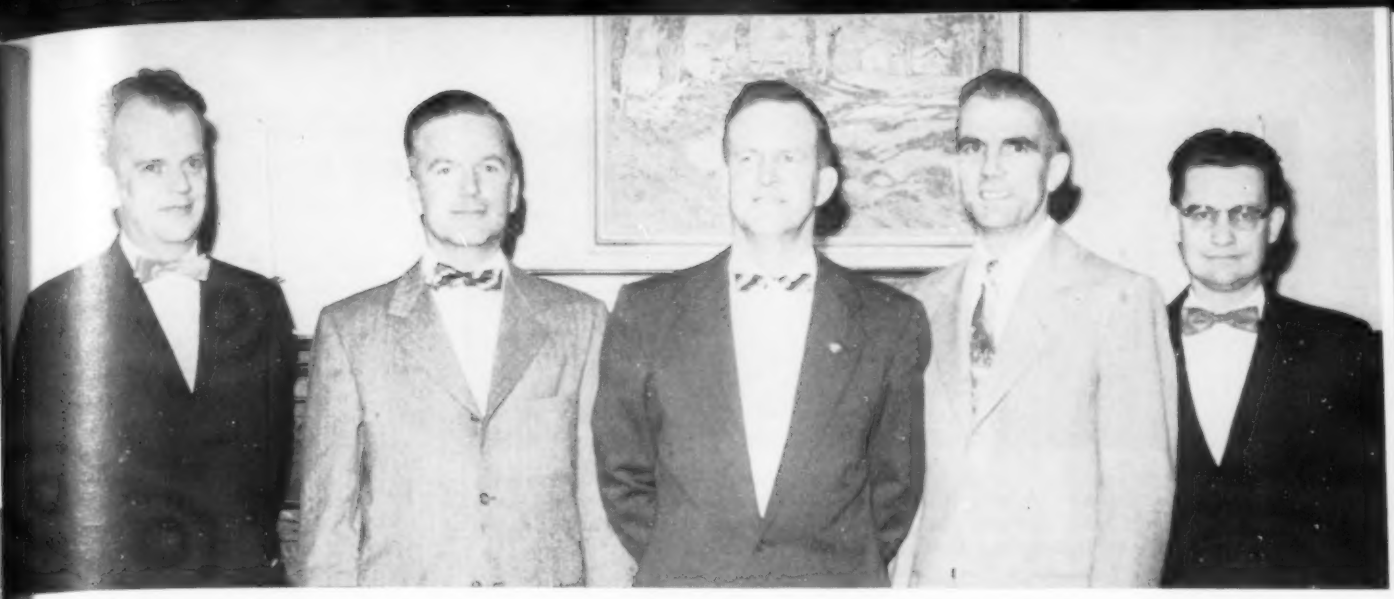
(Editor's note: Although not the first story of its kind, the Albuquerque article illustrates what can be done for better chapter relations and more extensive publicity) *—H. E. Anderson*

chapters

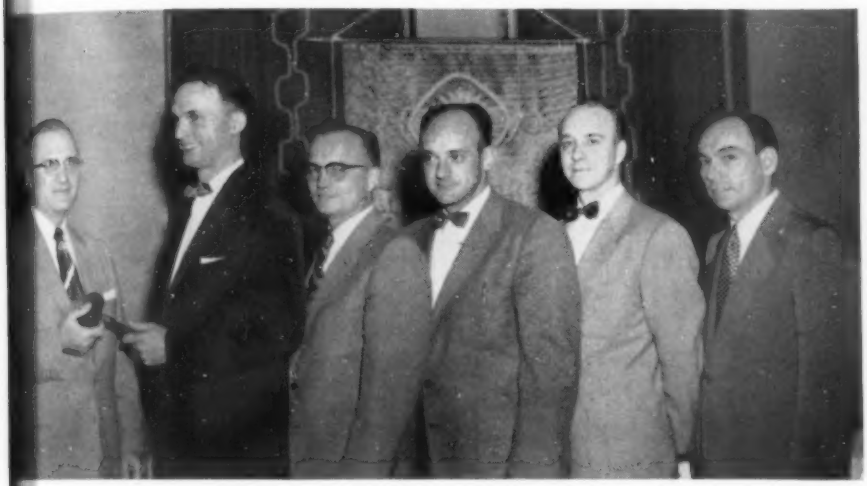
install 1954-55 chairmen

New officers of the Louis Joliet chapter review past activities in the pages of *The Tool Engineer*. They are: front, Francis "Doc" Bowers, first vice chairman; Mel Burdett, chairman; and Harold Zierke, second vice chairman. Looking over their shoulders are: Ray Eken, secretary; and Paul Travers, treasurer.

Joseph P. Crosby, first vice president and a national director of ASTE for 1953-54, presided at installation ceremonies for Fond du Lac chapter. Form left to right, are: E. J. Kaiser, retiring chairman; Robert R. Brechin, first vice chairman; Mr. Crosby; John O. Bahr, chairman; N. P. Schnettler, secretary; Lynton A. Kirby, treasurer; and H. S. Faith, retiring first vice chairman. H. C. Soukup, new second vice chairman, is not in the picture.



Hartness House in Springfield, Vt., was the scene of the Twin States chapter's installation ceremonies on March 12. It was also ladies night as Floyd McArthur, past chairman, installed the new 1954-55 officers. They are: from left, Glen Easten, treasurer; Jen Cameron, first vice chairman; Martin Parker, chairman; Harold Noyes, second vice chairman; and Edward Brown, secretary.—*Morris Blais*



Howard C. McMillen, third vice president and a national director of ASTE for 1953-54, presents the gavel to Charles A. Haugk, new chairman of the Fort Wayne chapter. Other officers from left, are: Joseph A. Deck, first vice chairman; Richard W. Good, second vice chairman; Gene E. Hoover, treasurer; Richard G. Spaw, secretary.

Leaders of the Lima chapter for the 1954-55 term are: seated from left, R. E. Fromson, chairman; and H. W. Carey, first vice chairman. Standing are: W. J. James, second vice chairman; John E. Kuck, secretary; and William E. Epley, treasurer.

Erie officers were installed by Joseph L. Petz, seated, left. Shown with him are: W. F. Snook, chairman, and William Kaehler, second vice chairman. Standing: Harry Rudd, past chairman; Gene Karnes, treasurer; and H. W. Sedler, secretary.

New Haven officers installed recently include: Russell Applegate, treasurer; Stanley Porritt, second vice chairman; John Brozek, chairman; Emanuel Lull, national delegate; Fred Dawless, past chairman and installing officer; Charleton Gilbert, first vice chairman; and George Griffith, secretary.

Gilbert Receives New Haven Service Award

New Haven—The service award for 1953 was presented to New Haven chapter's Charleton Gilbert for his outstanding service to the chapter in handling the advertising in the bulletin. The presentation took place at the March 11 meeting. In addition to the installation of officers, the program also included presentation of plaques to three affiliate members and a panel discussion on heat treating.

Recipients of the plaques were: Winchester Arms Co., Farrell Birmingham Co. and F. Hallock Co. Participating in the panel were: Henry Keshian, Robert Burgess, John Brozek, Emanuel Lull, Maur J. Weldon, Alfred Sharf, and Royce Strickland.

Plans for the annual Connecticut Day celebration were also discussed. Frank Shute is chairman of the committee making the arrangements. About 110 members and guests attended the dinner session held at the Hotel Garde.

Also scheduled for March was a series of educational lectures on carbides which were held at Mason Mechanical Engineering Laboratory. On March 8 Roland F. Hudaverdi of Carboloy, spoke on the manufacture of carbide; and on March 15 A. E. Glen, also of Carboloy, spoke on uses of carbide dies; and on March 22 Thomas E. Hayes of the same firm, talked on the proper use of carbide tools. Nearly 70 members and guests attended each lecture. Kenneth L. Ireland handled the registration.

The chapter's February meeting featured the election of officers and a talk by J. L. Whitmore of Carboloy who spoke on carbides. *—Silas W. Becroft*

Named Sales Manager for Norton Abrasive Division

Donald L. Price, formerly sales manager of the Eastern Region of the Norton Co., has been named sales manager of the Abrasive Division of the Worcester, Mass., company. A member of ASTE, Mr. Price held membership in the Engineering Society of Detroit when he was Norton's district manager for the Detroit area.

Harry Conrad Addresses Little Rhody Members

ASTE Executive Secretary Harry E. Conrad and Past President R. C. Morris were special guests of the Little Rhody chapter at the March installation meeting. Mr. Conrad spoke on the growing importance of ASTE as a professional group, emphasizing the importance of members gaining recognition through professional registration.

Mr. Morris administered the oath of office to: chairman—William T. Nystrom; first vice chairman—Phil Peckham; second vice chairman—Paul Watelet; treasurer—Horace C. Bennett; and secretary—Karl Friedland.

Fred Kunath, retiring chairman, summarized the chapter's activities during the past year in his farewell address. He pointed to the gain of membership and encouraged all members to assist the incoming officers.

The chapter's achievement pin was presented to Bert Guindon, program chairman, for his outstanding work during the past year. An address was made by Richard E. Fiske of the New England Council. *—Richard Kilbane*

Long Island Roster Lists 550 ASTE Members

Long Island—Latest membership records of the Long Island chapter show that the group has increased over 250 percent since its chartering just three years ago. Reflecting the consistent and steady work of the officers and committees, the chapter now counts 550 members on its roster as compared to the original 214 charter members. The educational program of ASTE, excellent programs which have been widely publicized and a variety of helpful activities have helped set this record.

—Sara T. Moxley

Pictured at left, are: Joseph W. Cox, sprocket sales supervisor, Beldwin-Duckworth Roller Chain Div., Chain Belt Co., Worcester, Mass.; and Edwin A. Paul, field engineer from Chain Belt Co.'s Springfield, Mass., plant, who were the technical speakers on the Springfield, Mass., chapter's March 8 program. They are thanked by Charles Stonerod, technical chairman for the evening. New officers installed at the same meeting of Springfield chapter are pictured above. From left, are: Peter F. Scott, chairman; Hollis B. Moore, first vice chairman; Kenneth R. Blaisdell, second vice chairman; Robert Marquiss, secretary; and Karl Kuralt, treasurer.—*George H. Foy, Jr.*

Baltimore's retiring chairman, Donald E. Wernz, left, congratulates Richard W. Coleman after his installation as the 1954-55 chapter chairman. Other officers, standing, are: George Andrews, treasurer; Roy Pajarinen, secretary; Ernest Russell, second vice chairman; and Leroy Rubright, first vice chairman. The installation was conducted by Tom J. Donovan, Jr., a past national director.

Tom Donovan Conducts Baltimore Installation

Baltimore—At the annual installation dinner dance staged March 5 by the Baltimore chapter, Thomas J. Donovan, Jr., past national director and an honorary life member of the Baltimore chapter, was a special guest. He installed the new officers and presented distinguished service certificates to George Andrews, Harry B. Mecaslin, Roy Pajarinen and Thomas Burke.

At the chapter's February meeting, William K. Hodson, engineering manager of Methods Engineering Council in Pittsburgh took over the technical program with his talk "The Application of Work Simplification to Tool Design." An education film entitled "Methods—Time Measurement for Better Methods and Fair Standards" rounded out the evening.

—C. G. Kelley and Neil Heller

Ladies Invited to Portland Installation

Portland, Me.—It was annual ladies' night when the officers of Portland chapter were installed at the March 12 meeting at the Graymore Hotel. Ned Andrews officiated at the ceremonies.

The service award pin went to Howard Stevens, secretary of the chapter, for his outstanding contributions to the chapter during the past year.

In addition to the dinner, floor show, and dancing, the couples also enjoyed a talk by George Curtis, manager of a local television station. He told how television was changing the lives of people. *—Henry C. Hagman*

Gerald Sick Heads Rochester Officers

Rochester—New officers installed at Rochester's March meeting are: chairman—Gerald Sick; first vice chairman—William Kamola; second vice chairman—John Lawrence; third vice chairman—Clifford Sears; secretary—Ralph Vigna; and treasurer—Maurice E. Clark. Members elected them to office at their February meeting when they also heard a talk by Police Captain Henry H. Jensen who spoke on how vandalism can be combatted.

—Paul A. Bruno

Erie Officers Installed by Joseph L. Petz

Erie—Joseph L. Petz, 1953-54 chairman of the ASTE National Editorial Committee, was the installation officer at Erie chapter's March meeting. The dinner meeting, held at the General Electric Community Center, also included a technical program.

Harold W. Hagle was presented the service award for outstanding service performed during the past year and Harry M. Rudd was given the past chairman's pin. Technical speaker for the evening was John C. Kosky of Wales-Strippit Corp., North Tonawanda, N. Y.

—H. W. Sedler

Canton Chapter Awards Handbooks to Students

The February 25 meeting of Canton chapter was held at Swiss Country Club and some 78 turned out for it. Election of officers was first on the agenda.

After elections, the educational committee presented student memberships to three students from area high schools. Along with the memberships each student received an ASTE *Tool Engineers Handbook* for his school. Still another student membership was presented to Howard Allmon from the Training Section of The Timken Roller Bearing Co.

Technical speaker was A. B. Myler of the Sun Oil Co. By simple experiments he illustrated very clearly for his audience "Some Practical Aspects on the Handling and Application of Soluble Cutting Oils." *—G. C. Hornbeck*

H. Dale Long, seated left, chairman of the National Finance Committee, installed Madison chapter officers at the March ladies' night meeting held at the Club Chanticleer. More than 100 members and their guests attended. Pictured on Mr. Long's left are John T. Murray, chairman; and Arnold Griswold, third vice chairman. Standing: Chester Frederick, secretary; A. J. Mergen, (who also received the outstanding service pin) treasurer; and Leonard Mueller, second vice chairman. Not shown is Larry Ellis, first vice chairman.—*A. J. Mergen*

At the Lehigh Valley March meeting, Sam Kuba, chairman of the membership committee, presented affiliate membership plaques to: David Jones, Hill Chase Co.; J. A. Van Hook, Edgcomb Steel Co.; and Paul Wood, V & M Tool Co. The ceremony was held at the charter night party.

Past National Director Tom Donovan installs Lehigh officers: Ralph Mueller, first vice chairman; Jim Fairhurst substituting for William Scheible, second vice chairman; Vincent Scalese, secretary; Bruce Schaller, treasurer; John Folwell, national delegate; and W. O. Miller, chairman.

Lehigh Valley Marks Fourth Anniversary

Allentown, Pa.—Lehigh Valley ASTE chapter celebrated its fourth anniversary on March 19 with a very impressive meeting. Past National Director Tom J. Donovan, Jr., installed the 1954-55 officers and gave a short address on the history of the chapter and the national organization of ASTE. He also emphasized the responsibilities of all members and chapter officers.

John Folwell cuts the chapter birthday cake as Tom Donovan, left, and W. O. Miller look on.

Vincent Scalese was presented with the service award pin for his most outstanding service to the chapter during the past year.

A gift was given to Retiring Chairman John D. Folwell in appreciation of his splendid efforts in conducting the chapter through the past year. Another highlight of the evening was the introduction of the chapter's first woman member, Miss Virginia Stauffer, civil draftsman and student of tool design.

Technical speaker was Earle W. Johnson, chief development engineer, Rockford Machine Tool Co.

—Paul W. E. Gehris

Speaker Makes 79th ASTE Chapter Appearance

New Orleans—John A. Harrington, chief engineer at the DoAll Co., made his 79th appearance as a guest speaker before an ASTE chapter at the February 9th meeting of the New Orleans chapter. He discussed the lack of uniformity in our measurements and the necessity for constant calibration. Some facts pointed out by Mr. Harrington were that there are more than 2000 "standard" inches in our country and that it requires a pressure of 80 psi to remove all the air between gage blocks.

The election of officers for the 1954-55 term was held after the technical session. They are: chairman—J. P. Cimo; first vice chairman—M. P. Chatry; second vice chairman—S. S. Emerick; secretary—P. A. Young; and treasurer—George Gunn.

—P. A. Young

Executive Secretary Conducts Installation

Windsor, Ont.—New officers of the Windsor chapter were installed at March ceremonies conducted by Harry E. Conrad, executive secretary of ASTE. Of special interest was Mr. Conrad's talk on the Society which outlined long-range objectives and current plans of the entire organization.

After reviewing the past year's activities, Retiring Chairman Jack Johnson passed the gavel to the newly elected chairman, F. A. Ritchie. The award for outstanding service to the chapter was presented to Dick Carter.

The technical session was sponsored by F. F. Barber and Company and featured a talk by Ben F. Bregi, vice president of National Broach & Machine Co. His talk covered the principles of gear finishing. *—A. Underwood, Jr.*

Keene Co-Chapter Officers Installed

Some 75 members of the Keene co-chapter, Twin States affiliate, met at Kingsbury Machine Tool Corp. for the installation of 1954-55 officers on March 25. Floyd MacArthur, past chairman of the Springfield chapter, officiated at the ceremonies. Men who will lead and direct chapter activities for the new term are: chairman—Donald Emery; first vice chairman—Humbert Dardani; second vice chairman—Richard Swahnberg; secretary—Maurice Towne; and treasurer—Chester Werme.

Dean Lauren Seeley of the College of Technology, University of New Hampshire, spoke to the group and explained the functions of the University's experimental station and how it serves New Hampshire industry. He noted that through the cooperation of the State Planning and Development Commission, a field engineer is now available to help industries with their problems.

The February 25 meeting of the chapter featured election of officers. Speaker on the technical program was Harry Conn, chief engineer at Scully Jones & Co., Chicago, who talked on "Tooling for Automation." He stressed the importance of having the tooling for today's high production automatic and simple. —*D. J. Brown*

Waindle Officiates at Tucson Installation

Tucson—Over 65 members and guests of the Tucson chapter were on hand for the March meeting at Paulos Flame Room, when Roger F. Waindle, national ASTE president, installed the 1954-55 chapter of officers.

Outgoing Chairman Beach received his past chairman's pin and gave the annual summary of chapter growth and activity. An ASTE banner was presented to the chapter by the retiring officers.

President Waindle, as speaker, talked to the group on "The Tool Engineer in Modern Economy."

—*Joseph W. Vincent*

Northern Massachusetts to Award Scholarships

The Northern Massachusetts chapter executive committee has unanimously voted to award two scholarships, each in the amount of $250 for students graduating from high school in 1954. The awards will go to area students who are planning to study engineering.

—*Otto S. Nau*

R. C. W. Peterson, national secretary of ASTE, congratulates Morrice Otto after his installation as Racine's chapter chairman.

Morrice Otto Heads Racine Officers

Racine, Wis.—The March 1 meeting of the Racine chapter was held at the Elks' Club in Racine. The occasion was ladies' night as well as installation of officers for the 1954-55 term.

Raymond C. W. Peterson of Toledo, national secretary of ASTE, officiated at the installation ceremonies. The following will direct chapter activities for the coming year: chairman—Morrice E. Otto; first vice chairman—Robert Freres; second vice chairman—LaVerne Hicks; secretary—Vitas Thomas; and treasurer—Robert Monfeli.

George Strombeck was awarded the 1953 service pin for his outstanding efforts in carrying out the chapter's educational program.

On the lighter side, entertainment after dinner was provided by Tom Martin, "The Gay Deceiver," who acted as master of ceremonies. —*C. P. Nelson*

Cutting Oil Additives Discussed at La Crosse

La Crosse—Members of La Crosse chapter gathered at Trane Co. in La Crosse for their regular monthly meeting on February 23. The business session of the meeting was devoted to the election of officers. Leading the group will be: chairman—Wesley Bertelson; first vice chairman—Robert N. Phillips; second vice chairman—E. T. Neubauer; secretary—Jerold Hopkins; treasurer—Walter A. Charley; delegate—Robert Phillips; and alternate delegate—Norman Jacobson.

The effect of cutting oil additives was discussed by Herman J. Brenneke, engineer at Socony Vacuum Oil Co., Wadham's Division, during the technical portion of the program. The theory and performance were illustrated by Mr. Brenneke. —*Ed Giroux*

Tri-Cities Elects 1954-55 Officers

The February meeting of Tri-Cities chapter was the occasion for election of officers for the 1954-55 term. Elected were: chairman—Robert E. Canon; first vice chairman—Maurice J. Ullman; second vice chairman—Rayburn M. Knabe; secretary—Dan J. McKeon; and treasurer—Albert Vande Walle.

Earl Tenpound was the recipient of the service pin for outstanding work in chapter activities.

On the technical program, Kenneth P. Martin, manager of hydroform development for the Cincinnati Milling Machine Co., talked on his well-known ASTE topic "The Hydroform—A New Kind of Machine Tool."

—*Earl Tenpound*

New officers of the Tucson chapter flank Roger F. Waindle, center, back row, ASTE national president, who installed them in their offices. Front row, from left, are: Lester Detterbeck, delegate; John Oberteuffer, secretary; and Jim Matthew, alternate delegate. In the back row are: Gene Segerson, treasurer; Ted Kresler, second vice chairman; Mr. Waindle; Cy Jacobson, chairman; and Harry McClain, first vice chairman.

These officers of the Decatur chapter were responsible for the tour of the University of Illinois Engineering Laboratories taken in February. The group of 141 members and guests were accompanied by faculty members who acted as guides. Prof. Larry Doyle of the university's department of mechanical engineering planned the tour. Pictured here, from left, are: W. J. Highley, R. Haufee, A. Pretot, A. R. Gatts, J. W. Miller, C. Schleisier, and Prof. K. J. Trigger.

Kenneth Lovdahl Heads Milwaukee Corporation

A new corporation has been organized in Milwaukee to produce machinery, tools and design for the wire industry. It is Micro Metal Products, Inc., which is located at 3221 N. 31st St. Operations are headed by Kenneth P. Lovdahl, president of the company and a member of the Milwaukee ASTE chapter. The new company will feature rolling mills, turksheads, lock washer and other special wire-forming machinery, as well as accessories, tools and dies.

Named Plant Manager

Richard E. Sweney, Calumet Area ASTE member, has been appointed plant manager of the C. A. Dunham Company's Michigan City, Indiana plant. In his new capacity, Mr. Sweney is in charge of production of Dunham convector, baseboard and Fin-Vector radiation; unit heaters; pumps; and Vari-Vac precision temperature control equipment. Prior to joining Dunham, he had been with Pullman Standard Car Mfg. Co. in Hammond, Indiana for six years as quality control manager.

Waindle Installs Chicago Officers

Chicago—New ASTE officers of the Chicago chapter were installed March 1 by Roger F. Waindle, national president of the Society for 1953-54, who also presented a discussion on the principles and aims of ASTE.

Serving the chapter during 1954-55 are: chairman—John Beck; first vice chairman—O. J. Onken; second vice chairman—Richard Miller; third vice chairman—Harry Conn; secretary—Alvin Winkler; treasurer—Joseph J. Kavda; national delegate—Harry Paine; alternate delegate—John Beck; and trustee for the Marshall Blu Scholarship Fund—Gordon Benes.

For the excellent and interesting programs planned during the past year when he served as program chairman, Harry Conn was given the award for the most outstanding member.

Technical speakers at this meeting were James Meehan, sales director of the Brown & Sharpe Mfg. Co., Providence, R. I., and J. C. Wilson, chief engineer and sales manager of the Thompson Grinder Co.

In February, more than 300 members and guests attended the election meeting held at the Keymen's Club. In addition to chapter officers, four delegates to the Illinois Engineering Council were named—Ben Brochure, H. Verne Loeppert, Bernard R. Better and Larry Doyle. Presenting the technical program were Walter R. Catey, manager of manufacturing engineering at the Ford Motor Company's Aircraft Engine Division; and Albert Drantz, design supervisor at Scully-Jones & Co.

—Richard C. Berliner

Nashville Installs 1954-55 Officers

Nashville—Members and guests of the Nashville chapter witnessed the installation of new officers at their March 16 meeting at the B & W Cafeteria. Newly installed officers are: chairman—Gus Dobert; first vice chairman—J. E. Riordan; second vice chairman—Merle Preston; secretary—Joe Stibor; treasurer—J. E. Wilkinson; delegate—W. A. Thornberry; and alternate—Gus Dobert. The oath was administered by Horace Sprott, past chapter chairman.

The guest speaker was J. L. Minton, assistant cashier of The First National Bank, Nashville.

The February 16 meeting featured a talk by Arthur O'Sickey, service engineer at Standard Tool Co., Cleveland. His subject was entitled "Cutting Tool Efficiency."

—J. E. Wilkinson

Philadelphia Celebrates Sixteenth Birthday

Philadelphia—February 18th was a big day for the Philadelphia chapter, and a double-barreled event. The occasion was Philadelphia chapter's 16th birthday and election of 1954-55 officers.

In celebration of the chapter birthday, a dinner was held preceding the evening program. Among the past chairmen present were: John Strecker, Charles Crook, Foster Clayton, Tom Donovan, Jr., Howard Gross, Art Diamond, Sam Boyer, Bill Griffith and Al Luecke. Conrad Hersham, Philadelphia's first chapter chairman, blew out the candles on the cake.

The election which followed produced the following slate of officers for the coming year: chairman—Edward Hollingsworth; first vice chairman—Richard D. Gross; second vice chairman—Edward Wheeler; secretary—Howard Gross; treasurer—Walter Czarnecki; delegate—Campbell Pittsinger; and alternate Ed Hollingsworth.

"Automation" was the subject of the guest speaker, Dr. Otto Turchan, president of the Turchan Co., Detroit. Dr. Turchan analyzed the basic functions of the human brain and brawn in producing a finished part from blueprint information. He then drew an analogy to the basic elements in the control loop of the automatic machine.

The advantages of automation, according to Dr. Turchan, are eliminating operator fatigue; remote handling of dangerous materials—such as radioactive materials; production of complex parts with exacting tolerances—jet blades, disks, etc.; and high production of consistent quality.

—Jack Schroth

Dr. Otto Turchan, Philadelphia speaker

Officers Elected at Baltimore Meeting

Members and guests of Baltimore chapter met on February 3 and elected the officers who will lead them for the coming year. The following were elected: chairman—Richard W. Coleman; first vice chairman—Leroy Rubright; second vice chairman—Ernest Russell; secretary—Roy Pajarinen; and treasurer—George Andrews.

William K. Hodson, engineering manager of Methods Engineering Council in Pittsburgh, took over the technical portion of the program with his talk "The Application of Work Simplification to Tool Design."

An educational film entitled "Methods—Time Measurement for Better Methods and Fair Standards" rounded out the evening. *—C. G. Kelley*

Harry Conn Speaks to Calumet Area Members

Whiting, Ind.—Some 110 members and guests of the Calumet Area chapter gathered at Vogel's Restaurant to hear a talk by Harry Conn on March 17. Mr. Conn is chief engineer at Scully Jones and Co., Chicago.

After a color film entitled "Tool and Die Making—Keystone of Mass Production," Mr. Conn discussed the proper design of tools for efficient manufacturing methods. He also illustrated with slides various methods and problems when drilling, tapping, grinding and recessing.

Mr. Conn quoted one of America's tapping experts by saying, "Only 10 percent of the taps manufactured are worn out, the remaining 90 percent are broken in usage." He recommended following tap drill charts on pages 800-801 in *Tool Engineers Handbook* as a possible remedy to misjudgment.

Thomas Barber of the National Program Committee and Edward Dickett of the National Editorial Committee were special guests at the February meeting. George H. Sheppard, director of research at DoAll Co., Des Plaines, Ill., was the technical speaker and discussed "Friction Sawing and Low-Speed Conventional Evolution of Sawing."

—L. W. Montgomery

E. Philbin de Got Elected Vice President

Announcement has been made of the election of E. Philbin de Got to vice president of United Drill & Tool Corp. His duties will continue to be those of sales manager of the Chicago-Latrobe Division. He is a member of the Chicago ASTE chapter.

Grand River Valley chapter leaders who took office at the March meeting included: Roy Robertson, secretary; Grant Johnstone, treasurer; Percy Barber, chairman; Joseph Strite, first vice chairman; and Gilbert Dilly, third vice chairman. Clayton Henderson, not pictured, is the second vice chairman.

Percy Barber, left, receives the merit award for last year from Retiring Chairman Jack Ward.

—W. C. Little

It looks as though Rockford chapter's radio program on their contest for high school students is becoming an annual event. Pictured here at a rehearsal for the 1954 program, which was aired on February 16 from station WROK, from left, are: Jon Pruner and Bob Boyer, first prize winners; Walter Lewis, standing, chairman of the education committee for ASTE; Rosalie Fitzgerald, third prize winner; Howard White, of the Rockford editorial and public relations committee; Dennie Folkerts, grand prize winner of last year's contest; and Lloyd Swanson, Mechanics Universal Joint Co.

Principle participants in the March program of the Indianapolis chapter were: J. C. Hebert, sales manager of Jones & Lamson Corp., who gave the technical address; Howard C. McMillen, third vice president of ASTE for 1953-54, who installed the new chapter officers; Richard Garber, treasurer; J. P. Enright, chairman; Ted Harding, first vice chairman; John Huser, second vice chairman; Joe Penn, national delegate; and Lorance Sterns, secretary.—Murray Davidson

Indianapolis chapter's March installation meeting also honored the group's past chairmen. Present for the program were, standing, from left: D. R. Smith, John Horton, Howard Curfman, R. F. Krause, Ernest Hilkenbach and Joe Penn. Seated: H. D. Hiatt, Ronald Updike, Hayden Scherer, Joseph Huser and Harry Bosse. Dennis White and C. Wetzel were not able to attend.

Officers Installed at Rockford Meeting

Rockford—More than 120 members and guests of Rockford's ASTE chapter were present for the March executives' night meeting. Installation ceremonies were conducted by Dr. Harry B. Osborn, Jr., 1953-54 second vice president of ASTE.

A discussion was presented by W. W. Gilmore, president of Micro Switch Co. He spoke on working with and through people, stressing the importance of "letting the other fellow have your own way."

A feature of the meeting was the running of a tape recording of the radio broadcast put on over station WROK by the education and public relations committee of the chapter. Participants included mechanical drawing students and instructors from Rockford schools and Walter Lewis, chairman of the education committee; Lloyd Swanson and Dennie Folkerts, the grand prize winner in Rockford chapter's mechanical drawing contest last year.

Winners of this year's contest were presented awards at the February 11 meeting held at the J. L. Clark Mfg. Co. A total of 180 members and guests, including members of the National Standards Committee, attended the dinner meeting. Ralph Rosecrance, president of the company, gave a short talk on the history of the firm.

—Kenneth Hull

Stanley Phillips Heads Detroit ASTE Officers

Detroit—The March 18 meeting of Detroit chapter at Horace Rackham Memorial Building was a double-header, being a combination ladies' night and installation dinner. The men elected to lead and direct chapter activities for the coming year are: chairman—Stanley Phillips; first vice chairman—Carl Abbott; second vice chairman—Lenard Lovings; third vice chairman—Leonard Joseph; secretary—Tony Rogers; and treasurer—"Rudy" Andreason.

Retiring Chairman Michael Pinto presided at the meeting and was elected to the position of national delegate, and as is the tradition, Incoming Chairman Stan Phillips will serve as alternate delegate.

Entertainment-wise the group enjoyed a humorous talk by Dr. Murray Banks, former professor of psychology at Long Island University, and head of the psychology department at Pace College in New York City.

—Walter Schober

ASTE President Visits San Diego ASTE chapter

San Diego—ASTE's national president for 1953-54, Roger F. Waindle, installed San Diego officers at the chapter's March meeting which took the form of a dinner dance at the El Morocco Cafe. Other national officers participating were Wayne Ewing, secretary, and Ben J. Hazewinkel, member of the board of directors.

New officers of the chapter are: chairman—Herff Emerson; first vice chairman—Clarence Boyle; second vice chairman—Walter Hostetler; secretary—Ed Martin; treasurer—Winston Petricola; national delegate—A. E. Crom; and alternate—Jack McClure.

At the head table for the San Diego installation, from left, were: Mr. and Mrs. A. E. Crom, President and Mrs. Roger F. Waindle, National Director and Mrs. B. J. Hazewinkel, and Assistant Secretary-Treasurer and Mrs. Wayne Ewing.

Herff Emerson, new chairman of the San Diego chapter, received his chairman's pin from Ben J. Hazewinkel, right, national ASTE director.

At the chapter's February session, members elected officers for 1954-55 and heard a technical talk by C. K. Scneebaugh of the California State Board of Examiners. He spoke on the current professional status of the tool engineer. *—William Keller*

Hamilton Chapter Marks 117th Dinner Meeting

Hamilton, Ont.—Fischer's Hotel was the scene of the 117th dinner meeting held by Hamilton chapter since its beginning. It was on March 12.

William A. Dawson, of the National Professional Engineering Committee, swore in the new officers, and Retiring Chairman Bulmer presented the annual report of accomplishments for the chapter year. He also awarded George Churchill with the chairman's award pin for excellent service to the chapter, and presented the gavel, donated by students of the Delta Secondary School, to Chairman John Snyder.

Serving under John M. Snyder, chairman, are: first vice chairman—Frank C. Johnson; second vice chairman—Joseph A. Sheldon; third vice chairman—Harry B. Ward; secretary—Robert I. Hall; and treasurer—Ralph G. Fechnay.

The technical program brought Malcolm Wilkinson, of the public relations department of Canadian Industries, Ltd., Toronto, before the members. He spoke on "The Case of Plastics in the Field of Metals."

At the February 12 meeting of the chapter, Harry B. Ward, quality coordinator at International Harvester Co. of Canada, in Hamilton, was the technical speaker. Mr. Ward explained various charts and slides.

—John Litwin

Appointed Sales Engineer

John F. Davis, who held the chairmanship of the Fort Wayne chapter in 1949-50, has been appointed sales engineer by the South Bend Tool & Die Co., South Bend. Mr. Davis will cover Ohio, Pennsylvania, New York and Connecticut.

Four receive student memberships, as well as *ASTE Handbooks* for their schools from W. C. Neuner, center, chairman of the Canton education committee. The students are: from left, John Feller of Canton Catholic Central High School; Robert Andrews of Timken Vocational; Howard Allmon of Timken Roller Bearing Training Section; and Arlan Boughman of Washington High School.

Harlan Von Goldberg, the new chairman of Keystone chapter, is seated between Richard A. Smith, a national director of ASTE and Thomas J. Donovan, Jr., past national director of ASTE, who have just installed him and his officers. Standing are, from left to right: Otto Willig, secretary; Albert Sparrow, speaker; John Somers, first vice chairman; and Robert Fitzsimmons, second vice chairman.

Raymond C. W. Peterson, on the left, national secretary of ASTE, has just sworn in Chautauqua-Warren officers who are: from left to right, Herbert Cave, chairman; C. Irwin Hochhans, first vice chairman; Paul E. Anderson, second vice chairman; Laurence R. Green, assistant secretary; Gordon H. Carlson, secretary; Norman L. Wetter, treasurer; and Robert J. Wilson, Jr., past chairman and national delegate.

Chautauqua-Warren Officers Sworn In

Warren, Pa.—Raymond C. W. Peterson, national secretary of ASTE, conducted installation ceremonies at the March 18 meeting of the Chautauqua-Warren chapter. Nearly 100 members and guests turned out for the event at Marconi Outing Club.

Several committee chairmen appointments were also announced. Cleon L. Douglas heads constitution and bylaws, Leslie H. Beau Jean will serve as editorial chairman, and Robert W. Pihlblad was made membership chairman.

At the conclusion of installation ceremonies, Secretary Peterson congratulated the chapter on its wide program of activities achieved after its first year in ASTE and awarded Robert J. Wilson, Jr., retiring chairman, the traditional Past Chairman's Pin.

Past Chairman Robert J. Wilson, Jr., presents the recognition award to Laurence R. Green, editorial chairman of the Chautauqua-Warren chapter.

Additional awards were made by Chairman Wilson to Leslie H. Beau Jean who received the service award pin for his work as membership chairman, and to Laurence R. Green for his work as editorial chairman.

The technical session was highlighted by the talk given by S. G. Fletcher, chief metallurgist at Latrobe Steel Co., Latrobe, Pa. His subject was "High Carbon High Chrome Steel." The talk was supplemented by a sound color film on "Desegatized Steel," and Ray Kohl and Don Smith of Latrobe assisted him in the presentation.

Charles V. Moore, design engineer in the Reactors Unit of Knolls Atomic Power Laboratory, a division of General Electric in Schenectady, was the speaker at the February meeting. He discussed how nuclear fission produces energy in a nuclear reactor for the 142 members and guests convened at Norris Supper Club, Jamestown, N. Y.

—Laurence R. Green

Roy Dusseau Gets Gavel as Dayton Chairman

Dayton—The March 8 meeting of the Dayton chapter held at the Aviation Room of the Miami Hotel attracted some 65 members and guests. The new officers were sworn in by George A. Goodwin, a 1953-54 national director of ASTE; and the gavel was handed over to Roy J. Dusseau by Richard A. Miller, retiring chairman.

Committee chairmanships were also announced. They are: public relations —R. Knierer; education—John Dennis; constitution and by-laws—George Goodwin; membership—William Lawrence; standards—Ross Doughty; editorial—William J. Killinger; and program—C. Epperly.

Technical speaker for the evening was Edward C. Polidor, vice president of Optical Gaging Products, Inc. Examples of the use of the optical system for gaging inspection, tool inspection and active production were shown by Mr. Polidor. *—W. J. Killinger*

Election Night on Boston Calendar

Boston—The February 11 meeting of the Boston chapter, held at New England Mutual Hall, was designated election night. Officers elected were: chairman—Karl G. Nowak; first vice chairman—Charles Sadon; second vice chairman—Thomas Walsh; secretary—Robert Marsh; and treasurer—Frank Clark. The national delegate is Chairman Nowak, and the alternate delegate is Wilfred B. Wells.

Karl Nowak, chapter chairman

The technical portion of the program was devoted to a symposium on "Latest Methods of Foundry Practice," with three men participating.

Joseph B. Stazinski, manager of Lynn and Everett Div. of General Electric Foundries discussed the latest methods and improvements in shell molding.

K. J. Yonker, plant manager, Investment Casting Div. of Howard Foundry Co. in Milwaukee, showed a film and talked on the improvements that have been made with the lost wax precision casting method, whereby precision casting in stainless steels can be made to tolerances requiring the use of micrometers.

Douglas Scott, senior sales engineer, with the Morris Bean Co., Yellow Springs, Ohio, discussed with the aid of slides the famous Antioch process of making plaster molds.—*Harry Midgley*

Joseph P. Crosby Installs Officers

Some 150 members, guests and wives of Buffalo-Niagara Frontier chapter turned out for the March 13 installation party at Hotel Niagara, Niaraga Falls, N. Y. Dinner, dancing and games were on the program.

Joseph P. Crosby, first vice president of ASTE, was on hand to install the officers and talk to the assembled group on the many accomplishments of the Society as it affects those on the chapter level.

Installed were: chairman—C. S. Oliver; first vice chairman—H. W. Ellis; second vice chairman—R. S. Slate; secretary—R. W. Fitch, and treasurer—J. R. Fisgus. *—R. W. Fitch*

Herbert Steinman Heads Muskegon Officers

Muskegon, Mich.—Following 6:30 dinner at Pontaluna Restaurant, members and guests of the Muskegon chapter witnessed the installation of their new officers. The oath of office was administered by Harry D. Swanson, past chairman of the Western Michigan chapter. The incoming officers include: chairman—Herbert I. Steinman; first vice chairman—James Swineheart; second vice chairman—Wilbur Hecksel; secretary—James Chvala; and treasurer—John Baker.

During the ceremonies Paul Hornak, retiring chapter chairman, received the past chairman's pin; and Donald Frederickson accepted the service award on behalf of Marvin Johnson who was absent.

James E. Weldy of the General Electric Co. in Detroit, spoke on "The Tool Engineer—Key Man in Today's Competitive Economy" and emphasized that advances in tool engineering will reduce costs to consumers.

The meeting closed following the annual report by Mr. Hornak pertaining to the chapter's progress and growth. Out-of-town guests from Grand Rapids and Detroit swelled attendance to nearly 100 before the evening ended.

—H. I. Steinman

Los Angeles Members Open New Plant

Located adjacent to the Los Angeles International Airport, a new plant was opened recently by two members of the Los Angeles ASTE chapter. The newly established firm, known as Tools Inc., is operated by J. E. Riddle and John Gibson. Walter Hoh, formerly superintendent of Modern Tooling Corp., has been put in charge of the production of tools, dies, jigs and fixtures.

Sidney B. Jefferys, chairman, left, receives congratulations from E. Neal Dietler, retiring chairman and the national delegate for Piedmont chapter.

Robert H. Wolfe Elected Association President

The Cutting Tool Manufacturers' Association elected Robert H. Wolfe president of the Arrow Tool & Reamer Co. of Detroit, as its national president at the group's annual meeting. Other officers named are: vice president—K. R. Beardslee, general manager of Carboloy Department of General Electric; and treasurer—R. S. Spencer, president of Detroit Boring Bar Co. Mr. Spencer was re-elected to the treasurer's post.

Directors elected for three-year terms are: L. H. Skoglund of Scully-Jones & Co., Chicago; R. G. Michell of Eclipse Counterbore Co., Detroit; and George R. Smith of National Broach and Machine Co., Detroit.

Scrolls were presented to E. A. Goddard of Goddard and Goddard Co., Detroit; D. E. Van Deusen of Kelly Reamer Co., Cleveland; and Walter F. Fuller, Fuller Tool Co., Berkley, Mich., who were honored as past presidents of the association and commended for their faithful work and accomplishments during their terms of office as president.

R. C. W. Peterson Installs Piedmont Officers

Greensboro, N. C.—Piedmont chapter met at the Mayfair Restaurant on March 8 and Raymond C. W. Peterson, national ASTE secretary for 1953-54, was on hand to install the officers. The 1954-55 officers are: chairman—S. B. Jefferys of Greensboro, N.C.; first vice chairman—V. A. Hanson of Charlotte, N.C.; second vice chairman—A. R. Fairchild of Winston-Salem, N.C.; secretary—H. E. Newsome of Winston-Salem; treasurer—E. M. Ketchie of Kannapolis, N.C.; national delegate—E. N. Dietler of Charlotte; and alternate—S. B. Jefferys.

The service pin award went to A. F. Moosbrugger, business manager of the "Piedmont Tool Engineer" magazine.

Speaker on the program was Ben E. Douglas, director of the North Carolina Dept. of Conservation and Development. He addressed the group on the future of technical education in North Carolina. An active discussion followed with representatives of the State Dept. of Education, Governor's Committee on Technical Schools and local departments of education participating.

The February meeting was highlighted by a talk on "Latest Developments in High-Speed Turning Using Carbide Tooling." George R. Morin of Jones and Lamson Machine Co., Springfield, Vt., illustrated his talk with slides and a film showing the results of the Jones and Lamson research program.

—Howard A. Longfellow

Riddle Officiates at Lancaster Installation

Ephrata, Pa.—Greater Lancaster chapter officers for 1954-55 were installed March 9 by Kenneth Riddle, chairman of the ASTE National Program Committee. Mr. Riddle also announced some of the plans for the 1954 ASTE Industrial Exposition and presented an affiliate membership plaque to Mr. Pusey, representative of Bearings Co. of America, Lancaster, Pa.

The technical program was presented by Hugh R. Jackson, director of research, automotive laboratory of Atlantic Refining Co., Reading, Pa. He spoke on the use of radioactive tracers in petroleum research.

The annual report was delivered by Ray Moorhead, retiring chapter chairman, who summarized the past year's activities. Among the guests attending the meeting were John Malloy of the Baltimore chapter and William Jones of the Chicago chapter.

—George J. Coil

Greater Lancaster officers front and center. They are: left to right, Ray Moorhead, chairman; Robert Moser, treasurer; Reynold Schenke, second vice chairman, Truman Coy, chairman; Martin Sensenich, first vice chairman; and Theodore Morrison, secretary. Absent was Willis Houck, national delegate.

Coming MEETINGS

ATLANTA—May 17. "Tool Steels and Their Application" by R. F. Spellet, metallurgist, Tool Steel Div., Crucible Steel Co. of America, Syracuse, N. Y.

CANTON—May 20. Plant tour of automatic steel products at Cleveland Tapping Machine Co., Canton.

CEDAR RAPIDS—May 19. Plant tour of John Deere Tractor Works at Dubuque, Iowa.

CHAUTAUQUA - WARREN—May 20, 6:30 p.m., Warren, Pa. "How the Tool Engineer Can Use Silicones" by a representative of Dow-Corning Corp.

CLEVELAND—May 14. Train trip to Detroit for plant tour.

DAYTON—May 10. Anniversary meeting, featuring educational committee's annual program and also executives' night.

ERIE—May 4, Chevrolet Motor Car Division, Tonawanda, N. Y. Tour of the plant operations.

FOX RIVER VALLEY—May 25, 7:00 p.m., St. Charles Vets Club. "Diamond Abrasives" by Randy Myers of the Elgin Watch Co., Elgin, Ill.

GRAND RIVER VALLEY—May 7. Ladies' night.

GREATER LANCASTER — May 11, 6:45 p.m., Zinn's Diner, Route 222. Plant tour of Parrish Pressed Steel Co., Reading, Pa.

HAMILTON—May 14. Tour of Ford plant at Oakville.

INDIANAPOLIS — May 6. "Indianapolis Racing Car Design" by R. T. Jackson, sales engineer, Mfg. Div., Perfect Circle Corp., Hagerstown, Ind.

LOUISVILLE—May 11, 6:30 p.m., L. N. YMCA. "Automatic Drilling Machines" by Edward Flook, sales engineer, The National Automatic Tool Co., Richmond, Ind.

LIMA — May 7, Elks' Club. Annual spring dance. May 20, 6:30 p.m., Royal Pine Room. Talk by K. H. Kuklen, division sales manager, Amplex Division, Chrysler Corp., Cleveland, Ohio.

LONG ISLAND—May 10, 8:30 p.m., Garden City Hotel, Garden City, L. I., N. Y. "Atomic Energy for the Layman" by Charles V. Moore, design engineer and member of the advanced nuclear reactor unit, Knolls Atomic Power Laboratory Div. of General Electric, Schenectady, N. Y.

MID-HUDSON—May 11. Plant tour.

MILWAUKEE—May 13, 6:30 p.m., American Serb Memorial Hall. "The Tooling and Manufacture of the Maytag Automatic Washer" by Melvin Verson, vice president, Verson Allsteel Press Co., Chicago.

NORTHERN MASSACHUSETTS — May 18, 7:00 p.m., Petersham. "The Effect of Cutting Fluids on Machining Efficiency" by L. H. Scudholz, research associate engineer, Socony-Vacuum Oil Co., Boston.

PHILADELPHIA—May 20, 8:00 p.m., Bellevue-Stratford Hotel. A clinic on improved milling practices by M. D. Verson.

PIEDMONT—May 15, 8:30 p.m., Thomasville Women's Club, Thomasville, N. C. Annual Dinner Dance.

PITTSBURGH—May 7, 2:00 p.m. Annual plant tour.

SPRINGFIELD, MASS. — May 10, 7:30 p.m., Springfield Turnverein, "Materials Handling and Automatic Feeding" by Kenneth R. Blaisdell, field engineer, Bellows Co., Akron, Ohio.

TORONTO—May 5, 8:00 p.m., New Toronto. Tour of Continental Can Co. of Canada, Ltd.

TRI-CITIES—May 12. "Fabrication and Machining of Stainless Steel" by a representative of Allegheny Ludlum Steel Corp.

TUCSON—May 11, 8:00 p.m., Marcoe's Restaurant. "Magna's New Drilling Machine" by Paul Jones, industrial division manager of Magna Engineering Co., Menlo Park, Calif.

TWIN STATES—May 12. Plant visitation, Fellows Gear Shaper Co., Springfield, Vt. Dinner at Trade Winds Cafe, Springfield.

Prof. Frederick Preator, retiring chairman of the Salt Lake City chapter, congratulates Harry Todd, newly-installed chapter chairman.

Officers Installed in Salt Lake Ceremonies

Roy, Utah—The wives joined their husbands for a ladies' night celebration and the 5th annual installation of officers on March 6.

Retiring Chairman Frederick Preator took charge of the program and gave his report of the year's activities. The service award pin went to Reid L. Rice, editorial chairman and assistant treasurer, for his outstanding work for the chapter. Past Chairman Preator was presented with the past chairman's pin and a pen and pencil set.

Leslie Seager installed the new officers who are: chairman—Harry Todd; first vice chairman—William Bullough; second vice chairman—Merrill Shaw; secretary—Joe Oviatt; and treasurer—Reid Rice. —*Reid L. Rice*

Keystone Chapter Gives Two Service Awards

Scranton, Pa.—Presentation of two service award pins, instead of the usual one, highlighted the installation meeting of the Keystone chapter. Recipients were John Somers and Robert Fitzsimmons, who were honored for the great contributions to the establishment and growth of the chapter.

The installation ceremonies were conducted by National Director Richard A. Smith and Tom J. Donovan, Jr., past national director. Mr. Donovan also delivered an interesting coffee address, emphasizing the cooperation needed from each member for the continued growth and advancement of the chapter.

The technical portion of the program featured Albert Sparrow of Brown and Sharpe Mfg. Co., who gave an illustrated lecture on automatic screw machines. —*Joseph R. Rappenglueck*

Evansville Award Goes to James Bennett

Evansville—The annual installation of officers meeting drew an attendance of 125 Evansville members and guests on March 8. The swearing-in ceremonies were conducted by Henry Pernicka, past chapter chairman. The annual chairman's award pin was presented by Retiring Chairman Paul Voerling to James Bennett.

In addition to the election of officers held in February, the program featured a talk by Jack T. Welch, manager of the Machine Tool Div., Sheffield Corp. He spoke on the topic "Ultrasonic Machining of Hard Metals," covering the machining of such hard metals as carbide, tool steel, alnice, germanium, ferrite, quartz, glass, and many others. His talk was accompanied by slides. *—Guenther F. Wulf*

Evansville's retiring chapter chairman, Henry Pernicka, left, installed the 1954-55 officers at the March meeting. From left: Russell Wiberg, second vice chairman; Carl Doughty, first vice chairman; John E. Race, chairman; Roy Ackerman, secretary; and Monroe Ringus, treasurer.

Bert Jeffries Heads Peterborough Slate

Officers were installed at the March 5 meeting of Peterborough chapter in the Kawartha Room of the Empress Hotel. The newly installed officers are: chairman—Bert Jeffries; first vice chairman—Bruce McKenzie; second vice chairman—Hugh Heslip; third vice chairman—Fred Mason; treasurer—Ralph Sanderson; secretary—George Jeffery. Bob Dyer installed the 1954-55 executives.

Norm Wood was presented with the pin for outstanding service to his chapter as chairman of the entertainment arrangements.

Millionaire's Night festivities followed the installation. The guests enjoyed smorgasbord and dancing and some chance games. *—Don Moorley*

Dr. Osborn Swears in Twin Cities Officers

St. Paul, Minn.—Some 100 turned out for the march meeting of Twin Cities chapter during which Dr. Harry B. Osborn, Jr., 1954-55 second vice president of ASTE and a national director of the Society, officiated at the installation of officers. The meeting was held at the St. Paul Vocational School.

Darrel Coacher, past program committee chairman, received the service award pin for his contributions during the past year.

Dr. Osborn, technical director of Tocco Div. of Ohio Crankshaft Co., Cleveland, discussed induction heating, including basic theory, types of equipment, applications, tooling and limitations. *—Walter J. Comstock*

Men who will lead the Portland, Maine, chapter in 1954-55 activities are: from left, Frank Thomas, treasurer; Harold Chaplin, chairman; James Comeau, second vice chairman; Harold Stevens, secretary; and Ross Beaubien, first vice chairman.

Obituaries

Clyde Allen, past chairman of the Des Moines chapter of ASTE and one of the group's most active charter members, died recently in Des Moines where he had lived for the past 33 years. During this period he was associated with the C. E. Erickson Co., where he rose to the position of chief engineer.

In January of 1949, he joined the Cedar Rapids chapter of ASTE and a short time later became active in the formation of the Des Moines chapter. He served as secretary and first vice chairman before he was elected chapter chairman in 1951. Following his chairmanship he represented the chapter as delegate to the national convention of the Society and served as chairman of the chapter's advisory committee.

George Tillman Sheley, 58, member of the Indianapolis ASTE chapter, died March 1 at his home in Indianapolis. He was a tool and die designer at Merz Engineering, Inc.

Albert Goldman, vice president and general manager of Atlantic Tool and Die Manufacturing Co., Philadelphia, died suddenly on March 7. Mr. Goldman was national secretary of the National Tool and Die Manufacturers' Association and past president and national trustee of the Philadelphia chapter. He was also a member of Philadelphia's ASTE chapter, the American Society for Metal and the Philadelphia Ordnance Association.

Carl Rex, charter member of the San Gabriel Valley chapter, died on March 19 when he suffered a heart attack at his home in Monrovia. He had served as chairman of the constitution and by-laws committee and as a member of the chapter's nominating committee.

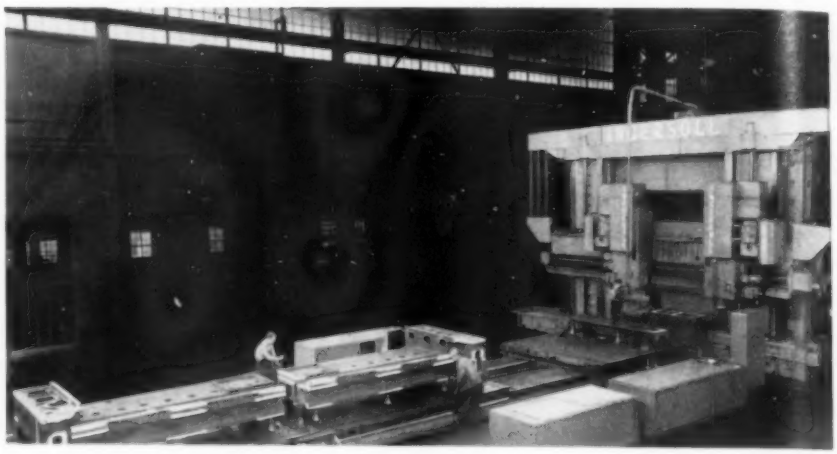
An industrial engineer, he was most recently associated with the Day & Night Division of Affiliated Gas Industries.

news in

METAL WORKING

MILL HAS CAPACITY FOR DEVELOPMENT WORK

Special adjustable-rail machine is milling a machine part on one table whole two large castings are being loaded on the other.

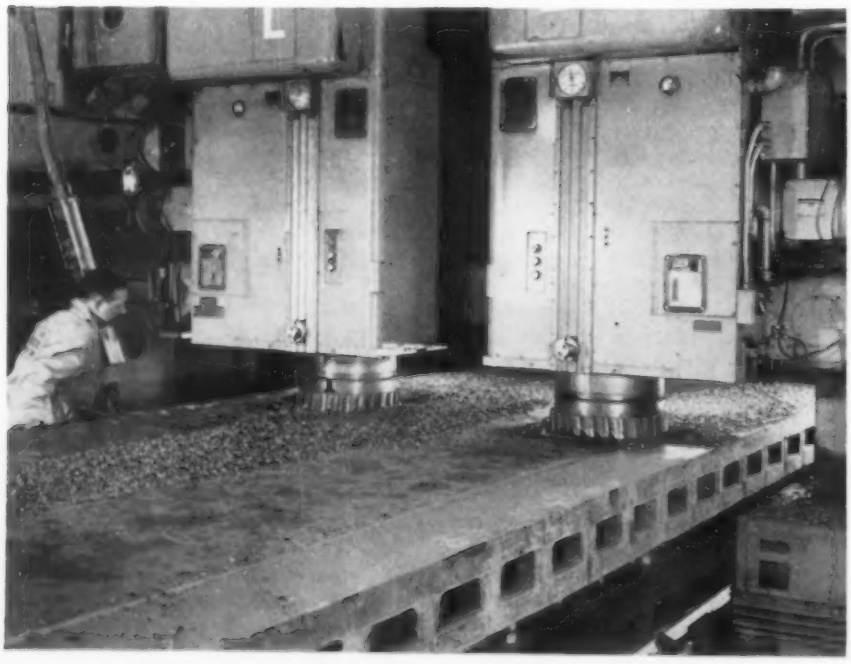


As part of its recently completed expansion program Ingersoll Milling Machine Co. has built and installed in its new erection room a special milling machine for production and development work. Having a total weight of 575 tons, the machine provides the mass rigidity for exploring the full potential of carbide milling cutters. In addition to such research the machine will be used to try out new designs and blade materials for inserted blade cutters, for experimental milling of new materials and for demonstrating the possibilities of heavy equipment.

One of the heads of the new machine has a 250-hp drive motor and three other individually driven heads have 150 hp each. The 870 hp machine is so designed, however, that up to 400 hp could be put through the large head for three minutes.

The worktable is split and can be used as one 62-foot unit or as separate 27-ft and 35-ft tables. In this way one table can be loaded or unloaded while the other is in operation as shown in the accompanying illustration. The machine has 14 feet between the housings and 12 feet under the rail.

Close-up of two heads roughing a cast-iron table top for a new machine. Feed is nearly 60 in. per minute, removing 9/16-inch stock with a special 14-inch dia carbide face mill. Former feed rate on this work was 20 ipm.



Despite its size, the machine is fast acting and easy to operate, with almost complete pendant control. Power shank rods make cutter changing easy and quick. There are no hand levers on the vertical heads, spindle gear changes being power operated and controlled from the pendant. Power-operated rail clamps and quill locks are also pushbutton controlled.

The new erection shop in which this special design adjustable rail milling machine is installed is a streamlined structure with the height of a five-story office building. The floor consists of reinforced concrete, from 18 to 36 inches thick to prevent machine sag during assembly and test. Two railroad tracks enter the building through newly built train sheds. Double overhead doors reduce heat losses when cars are moved in or out. The new shop is lighted by incandescent and mercury-vapor lamps in ceiling clusters.

The chip disposal system was designed in advance and built into the foundation of the machine. Chips fall through floor gratings into pits running the full length of the bed on both sides of the machine. Oscillating trough-type conveyors at the bottom of the pits remove the chips, depositing them in

hopp[ers] at the end of the machine. From [the] hoppers they are carried from the [machine] by an endless chain conveyor syst[em] to ceiling height, then outside the [building] 125 feet from point of orig[in] where they are dumped into port[able] bins for removal.

METAL SORTING WITH INSTRUMENTS

The kind of problem that confronts many a plant involves sorting metal parts with varying alloy content that accidentally have become mixed. Research engineers have been concerned with creating a device, which is easy to operate in any surroundings, will separate these parts when identification is seemingly lost, the only distinguishing feature being composition.

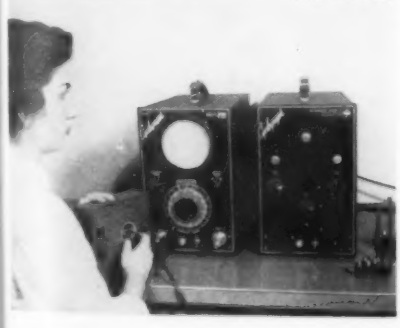
Now one such device, the Thermoelectric metal comparator, has been developed in General Motors' research laboratories. In its trial uses, it was found capable of sorting a stock of mixed SAE 1112 and SAE 1117 steel, which differ in carbon content by only 0.05 percent. In another test, it separated two types of automotive valves which differed again only slightly in chemical content or alloys. In addition, it detected chills in castings, an important factor in quality control.

The GM comparator uses the principle of a thermocouple, in that the comparator's circuit is a loop of two different metals, the part being tested forming part of the loop or circuit. The instrument's two probe tips are the hot and cold junctions where they touch the metal under test. Since temperatures of the two junctions are kept constant, the change in metallic composition of the part under test results in a voltage change that can be read on the instrument's meter. Several sets of tips in different alloys of steel and other metals are available. Choice of them for a particular job is made by trying the various sets, and using the one that gives the best separation readings for sorting the metals at hand.

Another device for similar nondestructive testing and sorting is the C-1 Cyclograph developed by the J. W. Dice Co. This instrument can be used on either ferrous or nonferrous metals, and will sort raw stock, semifinished or finished parts by their metallurgical characteristics. In this case testing proceeds thus: an acceptable part is used as a "standard" and the Cyclograph quickly separates all unwanted parts. Parts can be passed through the test coil by hand or by a feeding means and the relay unit of the instrument sends out a reject signal whenever an off-standard part passes through the test coil. The signal is picked up by a solenoid operator reject gate or other reject means. If checking is done by hand, the operator watches the unit's screen and manually discards the piece when the proper signal appears on the screen.

Above. The demonstrator here uses the G-M metal comparator to sort automotive valves simply by touching a pair with a hand probe.

Below: The operator checks metal parts with the Dice unit to identify them merely by metallic characteristics.



QUALITY TESTS GIVEN CREDIT FOR CASTING SUCCES .

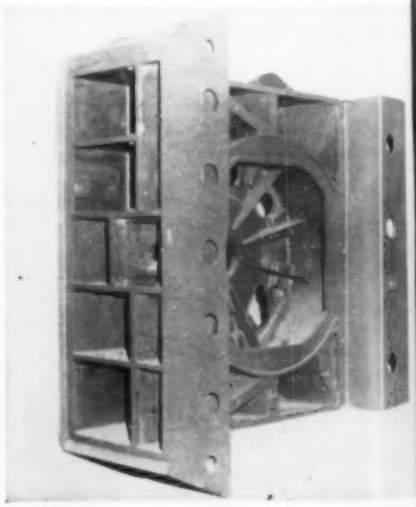
An outstanding foundry achievement in magnesium working has been attained with the largest casting of that metal ever poured. This accomplishment in the light metal molding field was made by Rolle Manufacturing Co. of Lansdale, Pa. to fill an order by Western Electric Corp. which will use the casting as a base for military electronic equipment.

Quality control procedure was the important element to which success of the undertaking was laid. Since castings of relatively small parts is a complex operation, such great size multiplies the problems accordingly. Typical of the quality control checks used were tests for moisture content, permeability and core strength of the sand. Quantometer readings were taken from the melt to assure chemical conformation of the magnesium alloy, and the readings were later double checked by wet analysis. The heat was laboratory tested for tensile strength, elongation, yield, hardness and numerous other physical characteristics. Dimensional checks were made for size accuracy and tolerances, while minute surface cracks were detected by Zyglo treating the entire surface of the mammoth casting and examining by X-ray radiography to avoid possibility of internal imperfections.

Weight of the giant 114 by 93 by 33 inch piece is about 1630—in steel it would weigh more than five times that amount. The 197 cores used were contained in a foundry flask measuring 128 by 112 by 48 inches.

The company has elaborated on details in a booklet, "New Horizons for Product Improvement with Magnesium and Aluminum Castings."

This giant magnesium casting offers a tremendous weight reduction as against a comparable steel piece.



METALLIC PLASTIC COMBINES QUALITY AND LOW COST

Economy is the big word in describing the development created by the Chemical Development Corp. for making dies, jigs, fixtures, forming dies, etc. The material, called Devcon, is putty-like in consistency, made of fine steel powders and an exceptionally strong plastic.

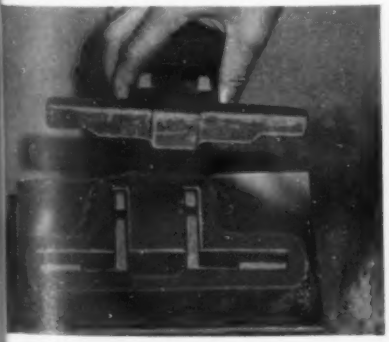
Worked much like modeling clay, steps in its use involve applying the plastic to a flat metal plate, pressing the desired model into a mass, allowing the impressed piece to remain unmolested until hard, a matter of about two hours. No heat or pressure is required in the operation, and after the desired shape has been completed, the material becomes very strong, tough and rigid as a metallic piece. If additional hardness is required, it can be chrome, nickel or copper-plated or metallized by conventional methods. The precision form is without distortion or shrinkage, and it can be sawed, drilled, tapped, threaded or ground with conventional metalworking equipment.

Resistant to most solvents, acids, oils and other chemicals, Devcon itself is 100-percent solid, containing no solvents.

A convenient substance in case of error in drilling or machining metal, mistakes can be corrected simply by spreading new material on or into the flaw and allowed to harden. The restored piece can then be machined in the same manner as the original.

Above. The putty-like substance is massed on a smooth surface preparatory to receiving the model's impression.

Below. The form is lifted from the plastic, leaving a clear, sharp imprint.



TOOLS of today

Ultrasonic Tools for Machining Hard Materials

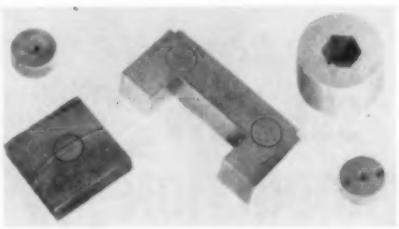
Machining operations on brittle or extremely hard materials can now be accomplished with a high-speed, high-precision ultrasonic machine tool, designed and manufactured by the Sheffield Corp., Dayton 1, Ohio. Using ultrasonic vibrations in combination with abrasive particles in suspension, the Sheffield Cavitron machine tool can produce through holes, blind holes, and contoured cavities in ceramics, glass, and precious stones, as well as in carbides and other fused and sintered materials or any metal or alloy.

Particularly in the electronics field, the extensive use of complex ferritic materials has created many problems which, due to the extreme brittleness of some of these materials, cannot be solved with ordinary machining methods. Yet these materials may be drilled, sliced, carved or cut off to various shapes or sizes by utilizing the ultrasonic machining technique; and low-cost, soft steel cutting tools are used to duplicate the most exacting contours.

Sectors of materials used as separators in an electrical conduit have been machined with a penetration rate of ⅛ inch per minute. The operation has given consistent results, in spite of the properties of this material. Ultrasonic machining offers a high degree of precision, elimination of chipping of the work material, and fine surface finish.

Above, work is under way.

Below, samples of results.



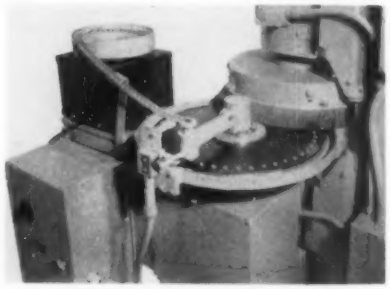
T-5-1281

Automatic Grinder

A double vertical spindle grinder with two parallel faces is offered by Besly-Welles Corp., Beloit, Wis.

Except for loading and emptying hoppers, the entire operation of the grinder is automatic. As an example of its operation, 1200 to 1400 oil pump eccentric rings are ground per hour. The rings are fed into a continuously rotating feed wheel which in turn carries the parts between two abrasive wheels. Both faces of the rings are ground simultaneously, removing a maximum of 0.009 inch of stock. Accuracy is held to 0.002 inch for size and 0.0003 inch for flatness and parallelism. After grinding, rings are unloaded by gravity into a discharge pan.

Proper loading of the eccentric rings is assured by a special safety mechanism. Should a part fail to properly enter the feed wheel, a radially mounted arm releases a limit switch and breaks the electrical circuit to the fixture drive motor.



Grinding is done wet with coolant conducted directly into the grinding zone through the upper motor spindle. A nonmagnetic coolant filter is used with the grinder for this application although magnetic separators can also be used.

It is easily adapted to grind small parts.

T-5-1283

Contact Welding Electrode

A contact electrode providing high-speed welding has been announced by the General Electric Co.'s Welding Dept., Schenectady 5, N. Y.

Best suited for work on mild and medium carbon steel, the rod is particularly adaptable for welding machinery, low pressure storage tanks, and light structural work. According to the company engineers, it is suitable for many welding operations requiring AWS classes E6012 and E6020 electrodes.

Work tests conducted with the contact electrode, showed more metal is deposited per unit of arc energy than any existing covered electrode, according to G-E engineers.

Encased in a rutile-type covering enriched with iron powder, the electrode can be used effectively on horizontal and flat position fillets and laps, single and multiple pass butts, and deep grooves and cover passes on multiple-pass butt welds.

Since the electrode is of the contact type, less physical effort is expended in welding, yet less welding skill is required.

The contact electrode develops up to 80 percent less spatter than other welding rods, and resultant weld slag is easily removed by a light tap.

T-5-1282

USE READER SERVICE CARD ON PAGE 139 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Slitter Knife Grinder

[illegible]ett Mfg. Co. of Big Rapids, Mi[illegible]nd Portland, Ore. has developed a [illegible]er for top and bottom slitter kn[illegible]and all types of circular knives. Th[illegible]el permits grinding slitter knives to [illegible]highest of precision tolerances, be[illegible]or concentricity and microinch fi[illegible]. This grinder, identified as SK-24[illegible]erates on the wet grinding principle [illegible]sing ample coolant directly applied at point of wheel contact. Assembly support has a rigid column type of mounting for vertical adjustment to all knife thicknesses. Gross slide movement and screw adjustments are positive and accurate, while automatic oscillation of the grinding wheel insures accuracy and fine finishes. The slitter

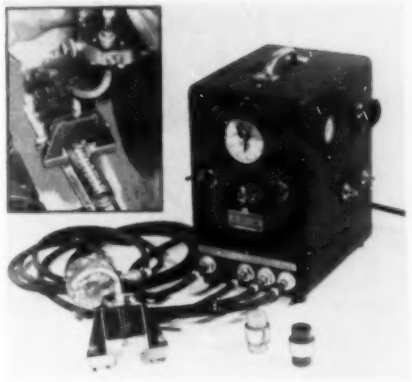
knife grinders are guaranteed to grind top and bottom slitter knives to an 0.0005 for concentricity, with surface finishes approximately 25 microinches or finer.

Slitter knives are held in a horizontal plane, rigidly supported by backing plate. Fixture revolves mechanically, for smooth, uniform cutting action; hence, no chatter marks develop on the knife edge. Top slitter knives are driven through a hardened pin which fits the hole in the slitter knife. Bottom slitter knives with sleeve to match are mounted as a unit with the adaptor. The fixture mechanism is totally enclosed for protection against dust, dirt, vapor and water. Large graduated dial adjustment is positive in its positioning for any bevel from 0 to 90 deg. A stainless steel diamond wheel dresser holder is mounted below the work fixture, easily adjusted so that wheel dressing and truing can be done easily and rapidly when necessary. **T-5-1291**

Centerless Grinder Gage

Several well-known Air-O-Limit gaging components have been combined by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. to form an unusual gage for use on centerless grinders. Consisting of a P & W Air-O-Limit snap gage, booster check valve and light signal control unit, the combined units are called the Air-O-Limit centerless grinder gage and will be shown at the ASTE Show in Philadelphia during April of 1954.

Basically, the gaging circuit used



in this application is the standard back pressure gaging system. The pneumatic control system in the light signal unit incorporates pneumatic precision relays and electric pressure switches proven to operate on a few millionths of an inch dimensional change with consistent accuracy and repeatability. Readily adjustable control limits can be pressed to any desired scale setting to meet varying tolerance requirements. The undersize and oversize lights on the control cabinet, in addition to giving the off tolerance signal can also be utilized to slow down or even provide impulses to control the machine.

Drop-off of back pressure between parts in through-feed gaging operations may be avoided by adjustment of the Booster Check Valve unit. The booster action itself imparts a faster indicator action than normally is obtained, and this Booster together with the check valve results in faster initial indicator action along with a decrease in indicator pointer drop-off between parts. **T-5-1301**

Slitting Machines

Low cost, compact slitting machines developed by the Stanat Mfg. Co., 47-30 37th St., Long Island City 1, N. Y., offer widespread possibility of in-plant slitting of all types of coils and sheet metal. By the use of standardized interchangeable parts, a series of tailored slitting units has been designed to meet a wide variety of manufacturing needs —two basic slitters can be modified by accessories and attachments to handle diversified jobs. Stanat model S-180 (pictured), to handle coil widths of 8, 12, 18 and 24 inches, is made with a basic arbor size of 2½-inch diameter, with larger diameter arbors for special purposes.

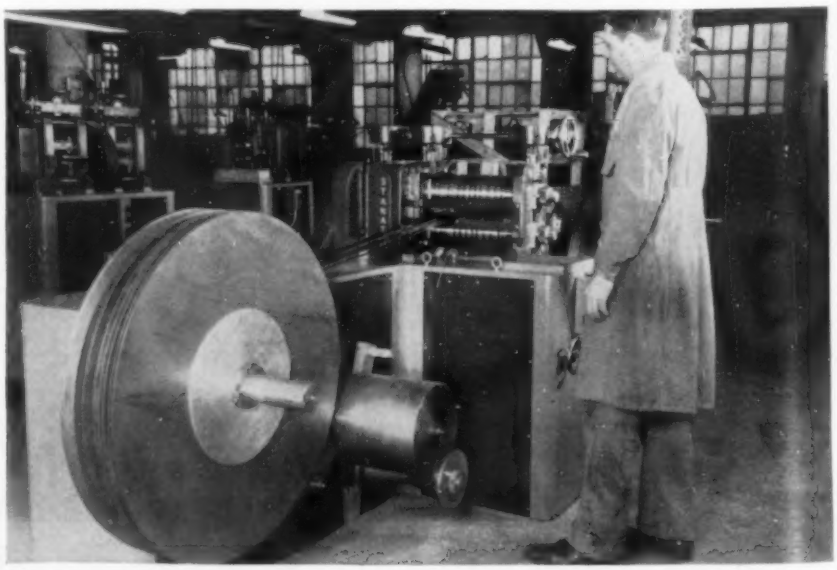
Many important attachments, such as exit and entry rolls, stock guides, feed and runout tables for sheet stock, and many special devices, are engineered for use with Stanat slitters. Standard attachments can be modified or special units built to suit individual requirements.

The slitters, which are built to the same rigid engineering specifications of larger and more costly units, incorporate a design whereby the slit coils are wound on core plates, thus avoiding expensive pushoff mechanisms. Cost has been further reduced by unit-mounting the recoiler on the slitter base, yet at a sufficient distance from the cutters to minimize the camber effect of fan-out.

Another prime feature is the recoiler tension control. Tension is adjustable while the machine is running by the use of a handwheel conveniently located at the operator's position. Tension requirements vary with different materials, the number of strips being cut, the width and thickness of the strips, the coil diameter, hence the importance of this feature.

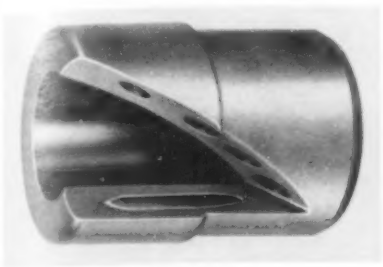
Scrap disposal from trim cuts is effected by providing a conveniently located arbor, with its own tension control, which winds the scrap into an easy-to-handle bundle.

These light slitters may be used for close tolerance slitting of ferrous and nonferrous metals, plastics, wire cloth, and laminated metals. **T-5-1302**



Guide Pin Bushings of Powder Metal

An original concept in guide pin bushings, a powdered steel alloy bushing which is heat treated and has sealed internal oil wells as an integral part of the bushing has been placed on the market by Allied Products Corp.,



Richard Brothers Punch Div., 1560 E. Milwaukee Ave., Detroit 11, Mich. These bushings are shipped to user with oil wells completely filled, and no external oiling is required throughout the long life of the bushings. Structure of the powder metal automatically assures proper lubrication to the friction surfaces.

Over-all wear characteristics of the bushings, comparable with fine bronze bushings, and guide pin wear are minimized. Also, the new R-B design greatly reduces the possibility of seizing and galling guide pins.

Therefore, obvious advantages to users are minimum maintenance, reduced costs and maximum press time. **T-5-1311**

Blast Cleaner

Pangborn Corp., Hagerstown, Md., are showing two blast cleaning machines and one dust control unit at the ASTE Exposition in Philadelphia.

A 1½-cu ft capacity Rotoblast Blastmaster cleaning barrel incorporates all the improved features contained in the larger types such as abrasive tight-loading door, rubber conveyor belt, conveyor drive with automatic torque throwout arm protection, antifriction roller bearings and conveyor take-up located at bottom of the work conveyor where it is readily accessible for smoothest operation and efficiency of barrel at all times.

The No. 2 size, cabinet model Hydro-Finish liquid blast machine has an accessory track and loading car with bearing mounted turntable. A drip tank and pan are provided for easy handling and washing parts after blasting.

The bag-type dust collector has a standard hopper, support and over-mounted exhauster. **T-5-1312**

Chilling Unit

A low-temperature chilling machine designed by Cincinnati Sub-Zero Products Co., Reading Rd. at Paddock, Cincinnati 29, Ohio, to meet the needs of small heat-treating departments, is being shown for the first time at the April meeting of the American Society of Tool Engineers in Philadelphia.

Weight of the unit is 500 pounds. Mounted on casters, it is 20 inches long, 18 inches deep and 48 inches high. Capacity of the chilling chamber is 1 cubic foot.

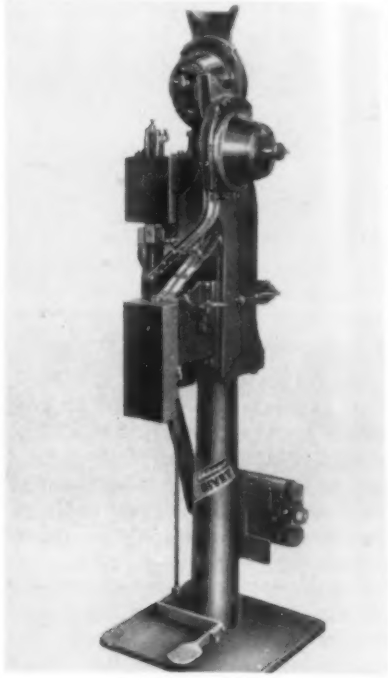
With the addition of a simple air circulator, the temperature range of this Model A-120-1 unit is from +70 F to −120 F. Temperature range from +250 F to −120 F can be obtained with the addition of a heater. For testing requirements, a wide variety of control instrumentation is available, including indicating and recording control thermometers.

The refrigeration system is hermetically sealed. 110 volt, single phase, 60 cycle. Unit may be connected to a standard outlet and requires no special installation procedure. **T-5-1313**

Double Riveter

Chicago Rivet & Machine C[o.] Bellwood, Ill., has designed an [unusual] double riveter, which rapidly feeds and drives compression rivets [it sets] of one solid male rivet into the [match]ing female tubular rivet.

In action, the tubular rivet [is fed]



to a rigid position in the lower (anvil) portion of the machine and acts as a pilot for assembling the elements to be riveted. The solid rivet drives from the top to meet the tubular rivet and form a strong uniform fastening with rivet heads alike on both faces of the assembly. Demonstrations of the unit are being made by Chicago Rivet & Machine Co. at the ASTE Exposition.

T-5-1321

Silver Plating

An industrial silver-plating solution, known as Nu-Silver, makes it possible to silver plate without electricity or other expensive equipment. At present it is being used in electrical and electronics work for silver plating connections, to increase conductivity and reduce resistance.

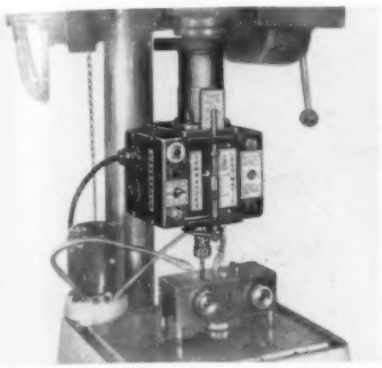
Application of the silver-plating liquid is a matter of seconds with a soft cloth or swab or by immersing.

Two kinds of Nu-Silver are now available: No. 66 formula, for nonferrous metals, silver, copper, brass, bronze, etc. and No. 67 formula, for all-purpose uses, both nonferrous and other metals.

More details are available from Specialty Manufacturers and Distributors, 508 New York, Aurora, Ill. **T-5-1322**

Lea Screw Tapper

An electrically controlled automatic lead screw tapping attachment which fits a drill press has been developed by the Commander Mfg. Co., Chicago, Ill. This Lead-Matic tapper handles the range 0 to $\frac{3}{4}$ inch and is designed to handle all types of production tapping,



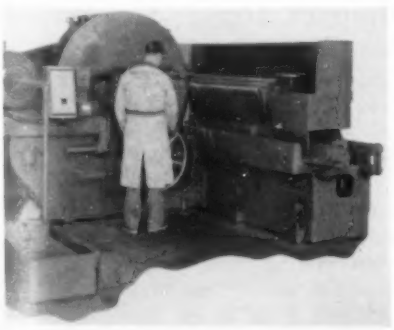
including precision work. Simple electrical controls permit quick, easy selection of the proper tapping action, either jog or circle, best suited to the particular operation. The Lead-Matic is a sturdy, lightweight, self-contained production tool incorporating the lead screw, lead nut and the entire tapping mechanism in a compact body.

T-5-1331

Knife and Shear Blade Grinder

The Hanchett Mfg. Co. of Big Rapids, Mich., announces development of a machine for grinding the bevels on all types of straight knives and shear blades, and all types of heavy duty shear blades. Several outstanding features, unusual for knife grinders, are incorporated in this new development. These make it possible to remove a great amount of metal in the shortest time possible. With extra heavy cuts possible on the workpieces, knives and shear blades are ground with no burning or heat generation.

According to the manufacturer, cubic inches of metal may be removed in excess grinding methods used previously for this type of operation, while actual test grinding on hardened steel knives has delivered them finish ground four to six times faster than before.



The Hanchett Big 60 Hogger features a 60-inch diameter segmental grinding wheel with a 5-inch diameter precision ground grinding wheel spindle mounted in extra heavy duty preloaded precision Timken bearings. The automatic infeed of the grinding wheel member incorporates hydraulic cam actuated control mechanism, with graduated dial, in increments of 0.0005 as standard. Finer feeds are available when required. In addition to the automatic infeed, there is a large manually operated handwheel, which makes this infeed a dual controlled unit.

The knife bar is mounted on top of a hydraulically operated heavy duty table with table travel speeds ranging from 10 to 100 fpm, with fingertip control. Faster table travel feeds are available at no additional cost when the operation requires it.

T-5-1332

Centerless Grinder

A low-cost versatile, centerless grinder is being displayed by the American Herforder Corp. div. of Metal Removal Co., 1546 N. Orleans St., Chicago 10, Ill.

This self-integrated unit can operate as a through-feed, in-feed, crushed form or template diamond dressed form grinding machine. In-feed grinding adapts the machine for producing formed, tapered, or perfectly concentric multiple diameter work.

Although this grinder is simple enough for unskilled workers to operate, it is said to provide an accuracy of 0.0001 inch.

Work capacity is from 1/16 inch to 5/8-inch diameter on steel and up to 1-inch diameter on nonferrous, ceramics, carbon, glass, cork, rubber, plastics and other low tensile material. The 12 x 2½ x 5-inch grinding wheel is driven by a 3-hp motor and the 7-inch feed wheel by a separate ½-hp geared motor with speeds of 21, 42 and 320 rpm. Both the grinding wheel and feed wheel spindles run in adjustable taper roller bearings.

This high-production grinder is suitable for mass production of identical parts, as well as batch production of different parts within the machine's capacity. It will be demonstrated at the ASTE Tool Show in Philadelphia.

T-5-1341

Impact Tool

Low-cost Electropunch, Model F, is introduced by Black & Webster, Inc., 445 Watertown St., Newton 58, Mass., as an addition to that line of solenoid-operated production tools.

It has open-back, C-frame construction to permit easy use with hopper or automatic feed. The solenoid and ram are of fixed height above the base. It delivers uniform impacts, adjustable from a few ounces to 3500

pounds, at rates up to 125 blows a minute, and can be operated from any 115-v, a-c outlet.

It features simple, interchangeable tooling with inexpensive tool blanks permitting easy setup by inexperienced operators. The punch or staking blank is made of drill rod 1 inch in diameter with a turned ½-inch diameter shank that fits directly into the spindle hole. The bolster plate or locating tool blank is a 3-inch diameter cast iron slug with a turned ¾-inch diameter shank which fits into the base pad hole.

Operating on the electromagnetic principle, with hand, foot or automatic switching, the Electropunch is offered with two impact ratings: 2000 lb (Model EH) or 3500 lb (Model FS). It is 20 inches high, weighs 50 lb and has a base 9½ x 9 inches. Throat depth is 5 inches; shut height 3¼ inches. **T-5-1351**

USE READER SERVICE CARD ON PAGE 139 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Power Nibbler

A power nibbler, the Model G, that has a detachable crankcase is offered by Nord International Corp., 449 E. Central Ave., Orange, N. J. Simple adjustments with accessories, provided at no extra cost, allow the nibbler also to bead, fold, cut straight or circular and cut slots, louvers as well as irregular or freehand.

The nibbler mechanism operates in an enclosed oil bath. The detachable crankcase is so designed as to permit the construction of special frames for special purposes at reasonable cost. Reassembly of the detachable crankcase to any special type of frame is a simple matter with standard tools.

Ease with which the tools may be

changed is due to the patented lower toolholder that has the same center line as the upper holder and a hand-wheel quickly makes a fine adjustment to any desired setting. No rough adjustment is necessary.

Change also may be made from circular cutting to straight cutting without removing the lower slide block.

Only the upper slide need be released and removed by sliding to the rear.

Range of materials that can be cut is $\frac{3}{32}$-inch continuous cutting of cold rolled steel ($\frac{1}{8}$-inch short cuts), $\frac{5}{64}$-inch stainless and $\frac{5}{32}$-inch brass or copper. The largest circle that it will cut is $28\frac{1}{2}$-diam and the smallest $2\frac{23}{64}$-inch diam. Folds to $\frac{5}{64}$-inch and beading to $\frac{3}{32}$-inch plate thicknesses are readily accomplished. **T-5-1361**

Economy Diamond Wheels

Diamond grinding wheels with 2 to 4 times longer life, as a result of an ingredient added to its P.S.M. steel bond is being introduced by the Precision Diamond Tool Co. of Elgin, Ill. at the ASTE Industrial Exposition in Philadelphia. The new ingredient gives adequate porosity to efficiently grind carbide.

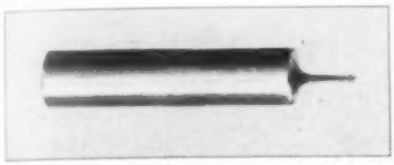
Outstanding feature of the P.S.M. steel bond is that it wets and bonds itself to the diamond particles, keeping

them from pulling out regardless of grinding pressure, thereby increasing the grinding efficiency.

All cup and periphery wheels in the new economy line are made with plastic centers to produce keener edges and reduce operator fatigue. The plastic center absorbs the spindle and grinding vibration and produces a smooth action comparable to resinoid bonded wheels. **T-5-1371**

Precision Boring

Short-necked boring tools, designed especially to facilitate the boring of precision holes, are being shown by Bokum Tool Co., Detroit 38, Mich., for the first time at the ASTE Exposition. Because the neck length of the tools is a trifle longer than the boring depth,



thus achieving maximum rigidity, the operator can bore holes to greater accuracy.

For practical purposes, this 500 Series offers virtually tailor-made tools at stock prices for high precision boring of small holes on screw machines and production boring machines.

There are twenty-five sizes in each of the Bokum styles—Style A, for through boring and Style B for bottoming. The tools are available both in high-speed steel and carbide-tipped. **T-5-1372**

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Cooling System

An improved version of their Atom-Lube noncirculating, lubricating and coolant system has been announced by The Henry G. Thompson & Son Co., New Haven, Conn.

The Atom-Lube uses a powerful air jet to atomize any desired cooling or lubricating liquid from water to heavy machine oils. According to Thompson, this system has been successfully applied to a variety of machining operations and has also produced excellent results when applied to grinding operations, with a resultant longer tool life, faster cutting speeds and improved work quality.

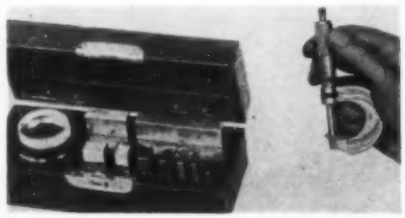
Formerly it was equipped with a

nozzle of soft copper tubing that could be bent to direct the vapor spray to the edge of the cutting tool at the most efficient angle. This tube has been replaced with a 12-inch nozzle of flexible tubing provided with two interchangeable inner tubes. One, of copper, is used where the nozzle is seldom readjusted; the other, of flexible plastic, is recommended where the position of the nozzle must be adjusted frequently. In addition, a 4 foot of ¼-inch ID plastic hose for the coolant reserve is now supplied, combining flexibility with high resistance to cutting lubricants.

T-5-1381

Gage Block Set

A 9-piece set of gage blocks, offering 331 different combination in 1/64 and 1/100 inch, is announced by the George Scherr Co. By setting a micrometer to the nearest combination, lead errors of the micrometer screw become immaterial, since the Ultra-Chex gage blocks are measuring standards accurate to within five millionths of an inch. Reliable measurements in 0.0001 inch can be obtained in conjunction with mocrometers, dial indicators, and other instruments. They



are first checked and set by means of Ultra-Chex length standards to the exact or nearest dimension required. For a few additional thousandths beyond the exact gage setting, any slight inaccuracies are neglible.

In addition, Ultra-Chex serve as micrometer standards for mikes from 0-4 inch. Optical parallel 1¼ inches in diameter by ½-inch thick, for checking measuring surfaces for flatness and parallelism, with a guaranteed flatness of ¼ of a wavelength, and parallel within 2-3 seconds, is optional.

Fully illustrated pamphlet can be obtained from George Scherr Co., Inc., 200 Lafayette, New York, N. Y.

T-5-1382

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-5-262-4	Air-Mite	**Air Presses**—Catalog discusses Air-Mite presses and air cylinders. (Page 262)
A-5-180	Allied Products Corp., Div. Richard Brothers	**Punches and Button Dies**—Catalog "Punches and Dies" discusses how R-B interchangeable punches operate. (Page 180)
A-5-13	American Drill Bushing Co.	**Drill Bushings**—New catalogs explain simplified method of ordering and describe features of drill bushings. (Page 13)
A-5-10	The American Tool Works Co.	**Lathes**—Bulletin 10 gives the complete story of the American Pacemaker Lathe. (Page 10)
A-5-164	B. C. Ames Co.	**Measuring Instruments**—Free catalog discusses Ames Precision Measuring Instruments. (Page 164)
A-5-137	The Barry Corp.	**Movable Machinery**—Bulletin "Look—No Lagging"! points out advantages of flexible production layouts and lower machine maintenance cost. (Page 137)
A-5-242	The Bellows Co.	**Air Motors**—Bulletin CL-50 discusses Bellows air motor and tells how it has cut manufacturing costs in various plants. (Page 242)
A-5-226	Besly-Welles Corp.	**Taps**—"Handbook for Tap Users" gives up-to-date tapping methods and tap selection. (Page 226)
A-5-247	Brush Electronics Co.	**Surface Finish**—Booklet describes how surface finish control can reduce machining cost, increase production capacity and help improve products. (Page 247)
A-5-262-1	Chicago Dial Indicator Co.	**Dial Indicators**—Illustrated 16-page catalog 106 describes the complete line of dial gages. (Page 262)
A-5-27	The Cincinnati Shaper Co.	**Press Brakes**—New 72-page catalog B-4 describes operations, features and special arrangements pertaining to Cincinnati press brakes. (Page 26-27)
A-5-168	Cleveland Tapping Machine Co.	**Tapping Machines**—Catalog TE-54, "Production Tapping Guide," explains how Cleveland tapping machines will improve efficiency and increase hourly output. (Page 168)
A-5-194-4	Colonial Bushings, Inc.	**Drill Jig Bushings**—Handy "Flip-a-page" Catalog B-649, describes the advantages of Colonial drill jig bushings. The catalog aids in easy ordering. (Page 194)
A-5-262-3	Cro-Plate Co., Inc.	**Burr Removable Machinery**—Illustrated 8-page booklet tells how to remove burrs from precision gears. (Page 262)
A-5-155	H. E. Dickerman Mfg. Co.	**Automatic Die Feeds**—Literature and catalogs tell how Dickerman feeds lower production costs. (Page 155)
A-5-249	Eastman Kodak Co.	**Contour Projectors**—Booklet "Kodak Contour Projector" explains the uses of applications of optical inspection. (Page 249)
A-5-183	The Falcon Tool Co.	**Counterbores**—Catalog 53 describes drive interchangeable counterbores which are obtainable in high-speed or carbide-tipped cutting edges. (Page 183)
A-5-161	A. B. Farquhar Div., The Oliver Corp.	**Hydraulic Presses**—Catalog shows the sizes and capacities for all types of industry. (Page 161)
A-5-15	Federal Products Corp.	**Dial Indicators**—52-page catalog tells how Federal gages help cut manufacturing costs. Page 14-15)
A-5-12	Gisholt Machine Co.	**Balancing Machines**—A booklet on the principles of, and with the title, "Static and Dynamic Balancing." (Page 12)
A-5-166	Gorham Tool Co.	**Milling Cutters**—120-page catalog shows entire line, and contains engineering information. (Page 166)
A-5-170	Hannifin Corp.	**Riveting Equipment**—Bulletin 150 discusses hydraulic cylinders "C" frames and pressure generators used in production riveting. (Page 170)
A-5-212	Haynes Stellite Co., Div. Union Carbide & Carbon Corp.	**Metal-Cutting Tools**—Manual on cutting tool practice has been prepared to help users get most benefit from Haynes Stellite tools. (Page 212)
A-5-229	The Jacobs Mfg. Co.	**Collets**—Catalog 54-CC discusses nomenclature and advantages of new type Jacobs chuck. (Page 228-229)

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A-5-230	The Charles L. Jarvis Co.	**Taps**—New 56-page tap catalog and manual completely describes taps. (Page 230)
A-5-231	The Charles L. Jarvis Co.	**Tap and Drill Heads**—Catalog discusses the Torqomatic Jarvis automatic tap holders. (Page 231)
A-5-235	Keller Tool Co.	**Air Tools**—Catalog 92 fully describes and illustrates about new portable, automatic "Airfeed drill." (Page 235)
A-5-32	Kling Bros. Engineering Works	**Bending Machines**—Bulletins describe the various types of bending rolls as well as other machines. (Page 32)
A-5-16	The Lapointe Machine Tool Co.	**Broach Retilting Fixture**—Bulletin DRV-5 describes the midcycle retilting automatic fixtures, which permit the broaching of nonparallel contours. (Page 16)
A-5-188	Lepel High Frequency Laboratories, Inc.	**Induction Heating Equipment**—Illustrated, 36-page catalog contains information on high frequency induction heating. (Page 188)
A-5-184	Lindberg Engineering Co.	**Induction Heating Units**—Bulletin 1440 tells how induction heating units speed up production soldering, brazing, hardening, annealing and stress relieving operations. (Page 184)
A-5-248	Linde Air Products Co., Div. Union Carbide & Carbon Corp.	**Flame-Plating**—A booklet "Flame-Plating" 8065 explains how flame-plating can improve wear of plug and ring gages. (Page 248)
A-5-189	M.B.I. Export & Import, Ltd.	**Combination Horizontal and Jig Bore**—Illustrated brochure 103 points out the advantages of Dixi-60 combination machine. (Page 189)
A-5-209	Miller Fluid Power Co.	**Air Boosters**—Bulletin B-200 gives information for fluid pressure boosters. (Page 209)
A-5-172-1	Morton Machine Works	**Fixture Clamps and Details**—Illustrated catalog contains full size tracing templates of each product, loose leaf bound. (Page 172)
A-5-127	Nelco Tool Co., Inc.	**Carbide Tools**—28-page catalog gives complete line of Nelco carbide tools. (Page 127)
A-5-233	TOCCO Div. Ohio Crankshaft Co.	**Induction Heating Equipment**—A booklet "Typical Results of TOCCO Induction Hardening and Heat Treating" gives case histories of users. (Page 233)
A-5-160-2	Ortman Miller Machine Co.	**Air and Hydraulic Cylinders**—Catalog describes Ortman cylinders and contains a complete set of ½ and ¼-scale templates showing all cylinders and mounting brackets. (Page 160)
A-5-194-1	Parkwood Laminates, Inc.	**Forming Rollers**—Technical bulletin shows how to improve quality while lowering costs. (Page 194)
A-5-179	Simonds Abrasive Co.	**Grinding Abrasives**—A new bulletin ESA-188 describes the various types and advantages of Simonds abrasives. (Page 179)
A-5-138-2	South Bend Lathe Works	**Lathe Turrets**—Attachment bulletin 5321 shows 165 attachments and accessories. (Page 138)
A-5-160-2	Standard Parts Co.	**Jig and Fixture Components**—Illustrated 66-page catalog shows 150 drawings and new sizes and parts of jig and fixture components. (Page 160)
A-5-215	U. S. Tool Co., Inc.	**Press Room Equipment**—Complete specifications for the four sizes of the U. S. Multi-Slides are shown in bulletin 15-T. (Page 215)
A-5-219	Valvair Corp.	**Control Valves**—Bulletin TE-5 describes Valvair's Speed King solenoid operated control valve. (Page 219)
A-5-199	Vascoloy-Ramet Corp.	**Toolholders**—Catalog 435 completely describes toolholders for triangular, round and square inserts. (Page 198-199)
A-5-157	Vlier Engineering, Inc.	**Thumb Screws**—Catalog 50 tells why the various types of automatic torque thumb screws increase users' profits. (Page 157)
A-5-223	Waldes Kohinoor, Inc.	**Grooving Tools**—New 20-page technical manual contains full engineering data and applications of Truarc grooving tools. (Page 223)
A-5-144	Zagar Tool, Inc.	**Drill Jigs**—Engineering manual E-5 describes and illustrates the various types and advantages of Zagar self-clamping drill jigs. (Page 144)

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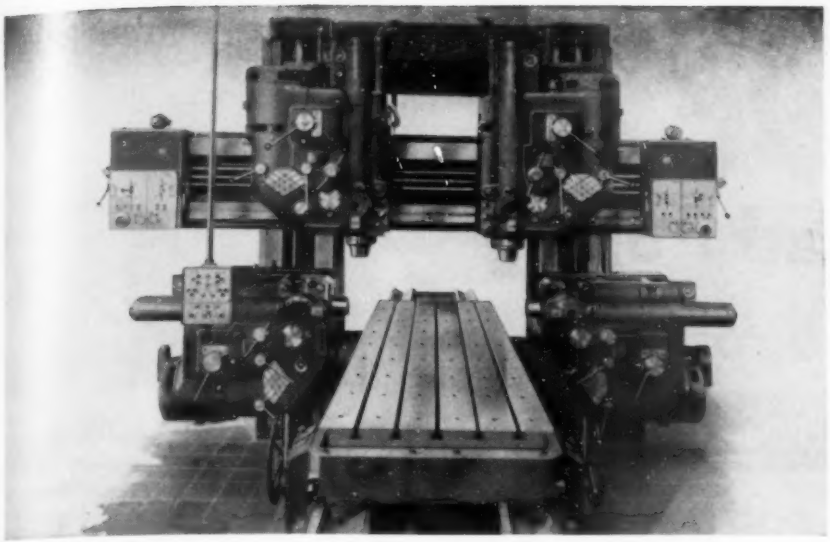


Heavy Duty Planers

Double-column heavy-duty planers and Plano-mills, designed to take advantage of carbide cutting tools, are offered by GSP of Paris, according to the U. S. Agents, Permasco, Div. of Winter, Wolff & Co., Inc., 76 Beaver St., New York 5, N. Y.

They feature infinite variations of feeds and speeds through improved Ward-Leonard control units. The tables, moving on special cast iron slides with thermal insulation, are equipped with a patented compensating heat expansion feature. Special provisions have been made to allow for planing on both the forward and return stroke in cast iron. Speeds from 15 to 300 fpm for planing are available at the turn of a dial. Milling heads can be equipped with up to 70 hp each and still provide for axial movement, thus permitting boring and drilling operations without resetting.

On special order, machines can be equipped for both planing and milling operations. **T-5-1411**

Cut-Off Machine

A high-speed automatic cut-off machine for use with either ferrous or tured by DeWalt Inc. It can be nonferrous metals is being manufacequipped with an abrasive wheel for cutting solid, ferrous bar stock and heavy-wall tubing or with a saw blade for cutting light sections of nonferrous metals and thin-wall steel tubing. Designated as the Model ME-1 automatic metal-cutter, the unit is an adaptation of a previous DeWalt manually operated cut-off machine. Now equipped with an air-pressure actuating mechanism, the ME-1 completes the entire cutting stroke automatically after the operator depresses the starting lever.

Outstanding feature of the ME-1 automatic is its fully enclosed cutting head and drive mechanism. For operator protection, a heavy metal hood covers all moving parts as well as the cutting member itself while the machine is in use.

The unit will be displayed and demonstrated at the ASTE Exposition in Philadelphia. **T-5-1412**

Metal-Cutting Band Saw

Oliver Machinery Co., Grand Rapids 2, Mich., has just announced a heavy-duty metal-cutting band saw, designed with a special nontilting table having two frictionless rollers and two ball transfers at the right of the saw. The right-hand table size is 42 x 42 inches. The left-hand table is 18 x 36 inches. The band saw has 38-inch diameter wheels with 21½-inch capacity under the guide. Power is provided by a

Reeves 5 hp variable speed motor unit, having a wheel speed range of 100 to 600 rpm. This gives a blade speed of approximately 1,000 to 6,000 fpm.

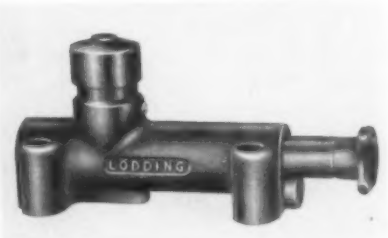
Due to the extra heavy table construction the machine is suitable for cutting of heavy plates or castings which would be difficult to handle on a conventional band saw table. Modifications of horsepower and speeds are possible to suit particular requirements. **T-5-1421**

USE READER SERVICE CARD ON PAGE 139 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Heavy Duty Jack

A heavy-duty jack, designed to save necessity of building special jacks, to support materials or parts being machined, is being introduced by Lodding, Inc., Dept. N80, 79 Beacon St., Worcester 1, Mass., at the ASTE Exposition.

This jack is horizontal in shape with a low over-all height, which provides



stability in handling heavy loads and enables it to be used in confined spaces.

The working mechanism is protected against chips and dust by a cap. Working parts are of hardened tool steel. All parts are coated with a Parkerized black finish to prevent rust.

The heavy-duty Lodding spring jack is available in three sizes, while a vertically constructed model is available for lighter work and to meet special requirements. **T-5-1422**

The Future of Titanium

technical digests

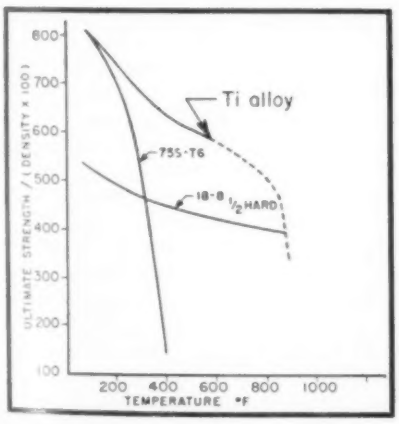
by Julius J. Harwood
Head of the Metallurgy Branch
Office of Naval Research

THE MOST WIDELY PUBLICIZED metallurgical development of the past decade has been the production of ductile titanium. The glamorous terms applied to titanium are evidence of the excitement it has stirred. Although continued study has sobered early overenthusiastic claims for the metal system, there is no doubt that the future position of titanium in our metal industry is firmly established. Undeniably there are attendant uncertainties and difficulties, but these result largely from the attempt to develop an entirely new industry in a fraction of the time normally required.

Physical Characteristics

One of the most significant is the high strength-to-weight ratio of titanium and its alloys. Even in the unalloyed state it compares favorably with most of the well-known structural metals and alloys. But intensive development produced alloys with strengths twice that of unalloyed annealed titanium, and continued study may result in useful alloys with much greater strengths up to 200,000 psi.

The high-temperature properties of titanium are intermediate between those of aluminum and steel. The strength/density ratio offers opportunities for appreciable weight savings. So far, investigation of titanium alloys indicates that 800 F is the upper temperature limit at which useful engineering properties still exist. Alloys now in the development stage, however, may raise this limit to 1000 F. Some of the temperature-limiting features are poor oxidation resistance above 1200 F and the embrittling effects of oxygen and nitrogen at these temperatures.



Comparative strength-weight-temperature relationships: Ti, Al and 18-8 alloys.

Production

Just as important as these characteristics is the question of availability and production of titanium. Although difficulties are encountered when it comes to extracting the metal from its ores, in actual quantity titanium is the ninth most abundant element and comprises about 0.65 percent of the earth's crust.

Up to five tons per day are being produced commercially by the Kroll process in a "batch" type of operation. The present price of titanium is $5 per pound for sponge and from $15 to $30 per pound for mill products, depending upon the shape, size and thickness.

The need for lower-cost production has stimulated an enormous amount of industrial development. Several new processes are in the pilot plant stage, and it is expected that within the next two years lower cost processes will be entering the production picture. One of the paradoxes facing the titanium industry is the reluctance of producers to expand their production capacity despite the immediate market which far exceeds present availability. They are afraid that a simpler and lower cost process will be developed.

Processing Sponge

In the early stages of development titanium and its alloys were fabricated from powder by powder metallurgy (pressing and sintering) techniques. But the development of arc-melting and induction-melting techniques has practically eliminated, with one or two exceptions, research and development work on powder metallurgy processing of titanium. Practically all ingot titanium is now made by arc-melting, which is used for both the metal and its alloys.

Continuous casting arc-furnaces have been developed, and titanium ingots weighing as much as one-half ton have been produced. Since it appears that the ingots will be processed chiefly in steel mills, the development of larger ingots for more economic fabrication can be anticipated. One disadvantage of the process is the insufficient homogeneity of arc-cast titanium alloys. This factor must be improved before there is wider acceptance and application of the alloys.

Machinability

The machining characteristics of titanium most closely resemble those of the stainless steels. Especially in the early stages of development, much difficulty was experienced in machining. By using methods especially adapted for titanium and by the development of suitable lubricants, many of the problems are being overcome. Because of the high rate of wheel wear, titanium and its alloys are difficult to grind. Galling and seizing have been particullarly bothersome problems. The ease with which titanium sticks to metal surfaces is also causing concern for some proposed applications. Intensive research is now under way for the development of lubricants and surface treatments to eliminate these difficulties.

Welding

Welding still remains as another major problem. Pure titanium can be successfully welded by resistance or inert gas-shielded arc methods. Obviously, because of its reactivity, care must be exercised to prevent hydrogen, oxygen, and nitrogen from coming in contact with hot titanium, or else brittle welds will result. In the case of titanium alloys, however, ductile weldments are the exception rather than the rule. The problem of the welding of titanium alloys is intimately associated with the state of understanding of

Technical Digests . . .

heat-treatment of these alloys. Much research is going on to learn how to heat-treat to avoid embrittlement.

Casting

It would be highly desirable if casting techniques, similar to those used with other engineering metals, could be applied to titanium.

Castings ranging from 10 to 100 pounds have been produced by skull-melting techniques with interesting properties. Mechanical properties have compared favorably with wrought alloys of similar compositions. Carbon pickup has been held below detrimental amounts. Skull-melting techniques are being applied also to the production of ingots and it appears that the process will be developed into a useful commercial process.

Powder Metallurgy

Despite the minor attention being given to the processing of titanium by powder metallurgy, methods have been developed by at least one industrial concern for pressing titanium compacts to theoretical density. Recent tests have indicated that such compacts exhibited properties equivalent to those of arc-melted material. This pressing operation is now being expanded for the production of titanium ingots and sizeable ingots have already been produced on an experimental scale.

It seems reasonable to expect that applications exist for titanium alloys for which appropriate use of powder metallurgy processes may solve fabricating problems. By resorting to direct pressing methods and thereby omitting the cast-ingot and subsequent processing stages, it seems conceivable that the present high cost of some titanium products could be reduced.

Field of Application

It is anticipated that for the next several years practically all the titanium production will be used in military applications—for prototype evaluation and for production items. Such requirements for 1954 have been announced as 25,000 tons. The primary large-scale use of titanium and its alloys will probably be found in the aircraft industry. In many cases, the weight saving and high temperature properties of the alloys offset present high cost.

Aircraft: Titanium has proven an excellent material for aircraft engine fire walls, shrouds, baffles, diaphragms, ductwork, brackets, and fittings adjacent to the engine and exhaust system.

Aerodynamic heating and high surface temperatures which occur with missiles and supersonic planes almost necessitate the use of titanium alloys. The skin temperature of a jet plane flying at 1400 miles an hour may rise as high as 450 F; at higher speeds surface temperatures of missiles can rise to 900 F. Since aluminum and magnesium alloys lose their structural usage above 300 F, plans are under way to use titanium for skins, leading edges of wings and fins for supersonic aircraft and missiles.

One of the more important applications developments is the use of alloys for gas turbine compressor components—disks, blades, and stator vanes. A 300-pound weight saving (representing up to 40 percent of the total weight) could be achieved by substituting titanium alloys for stainless steel in these applications. Research is also under way on titanium propeller blades and landing gear components made of titanium alloy forgings.

Marine: The outstanding resistance to sea water and marine environments, together with its light weight and fatigue resistance, immediately points to extensive shipboard uses. Although present prices are a discouraging factor, considerable prototype testing and evaluation is under way. Some of the uses being studied are: titanium seats and disk trims in salt-water valves, tubing for condenser systems and heat exchangers, wet exhaust mufflers for submarine diesel engines, and turbine blades for low-temperature steam turbines. Because of its high corrosion fatigue resistance and freedom from pitting, titanium has been considered for salt-water pump shafts, small outboard propeller shafts, snorkel tubes and as hull material for small craft such as PT boats.

Ordnance: As for ordnance applications, use of the metal in 81-millimeter mortar base plate has been widely publicized. The substitution of titanium for steel has cut the weight from 47 to 24 pounds, making it possible for one man to carry the base plate and increasing by 50 percent the fire power per man. The important weight-saving advantages have attracted further military interest for airborne and man-carried equipment. The Bureau of Ordnance is considering its usage in gun, guided missile, and armor plate programs. There is no question that, as production increases and prices become lower, military applications of titanium will increase tremendously.

From a report entitled "The Growing Promise of Titanium," appearing in Dec. '53 issue of Office of Naval Research *Research Reviews*. Photos Official U. S. Navy.

Mechanics of Drilling

by **Carl J. Oxford, Jr.**

Research Engineer
National Twist Drill and Tool Co.
Rochester, Mich.

To explore the cutting action of the twist drill an experimental technique was needed to permit examination of drill chips in the process of formation. Since extremely rapid deceleration is required to trap actual operating conditions in the chips, the shear-pin-deceleration apparatus, *Fig.* 1, was constructed. This permits virtually instantaneous stop of the relative motion between drill and workpiece. Because of

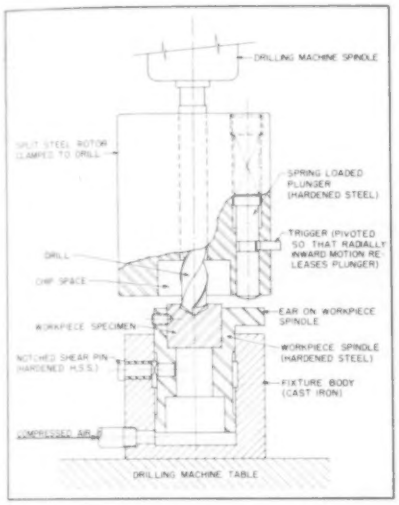


Fig. 1. Diagram of quick-stop apparatus for drilling research.

mass considerations, the relatively light workpiece and its spindle were accelerated to drill speeds rather than attempting to stop the heavy drill and machine spindle assembly.

During tests, after carefully removing the drill from the workpiece, it was possible to section the specimens in the direction of chip flow. Metallographic polishing and etching techniques revealed the grain structure of the specimens, so the metal flow pattern could be studied on the research metallograph. The chip formation mechanism along the cutting edges of a twist drill appear to be basically the same as for any other metal-cutting operation, *Fig.* 2. This photomicrograph of a typical drill section near the outside diameter of the drill is of AISA 1020 steel. Both the shear zone, the more elevated direction of crystal elongation and a small built-up edge can readily be seen. A similarity to planing and milling chips is apparent. Irregularities on the finished surface are small fragments of built-up

edge which have been sloughed off under the cutting edge.

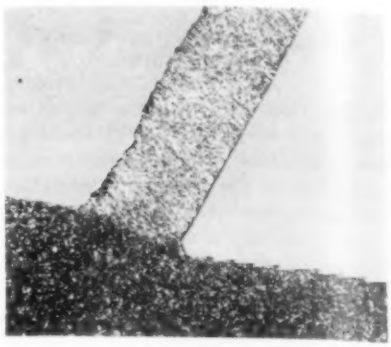


Fig. 2. Photomicrograph of drilling chip in AISI 1020 steel: 0.335 = inch radius, ¾-inch drill; 40X.

In order to properly orient the cutting edge chip sections, it was necessary to determine direction of chip flow. A photograph of the face of a drilling chip produced on the quick-stop apparatus is shown in *Fig.* 3. Drill chip flow has long been assumed to be substantially perpendicular to the cutting edge, but the photograph shows that this is distinctly not the case. Near the center of the drill the chip-flow direction is inclined to approximately 60 degrees to the perpendicular with a gradual falling off to about 15-degree inclination to the perpendicular to the outer corner cutting edge. Study of drill-point geometry shows that this is because a drill cutting edge is ahead of center and thus is oblique to direction of rotational motion. Hence, the cutting edge has a shearing or slicing action. This action is more pronounced near the center because here the obliquity of the cutting edge becomes greater. Other investigations have shown that an oblique cutting edge always causes inclined flow.

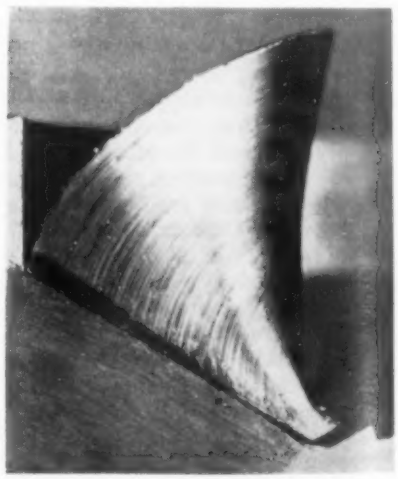


Fig. 3. Face of a drilling chip. Lines on the chip indicate flow direction.

With inclined chip flow and oblique cutting edges, the effective rake angle becomes quite different from the actual tool rake angle. Effective rake angle is measured between the direction of tool motion and the direction of chip flow.

An analysis of the complex geometry of the drill point coupled with experimentally determined data on drill chip flow direction has made possible an evaluation of the effective rake angle of the twist drill. The complete paper has a thorough treatment, including mathematical details of this analysis of chip flow angle, and its effect on the effective rake angle of the drill.

The effect of different point angles upon effective rake angle is shown in *Fig.* 4. For the standard 118 deg point angle, the effective rake angle is about 24 deg, just outside the chisel edge, decreasing to about 11 deg and about 0.120-inch radius, then increasing to about 33 deg at the periphery of the drill. For the 98 deg point the effective rake angle is appreciably reduced at small radii but slightly increased at the periphery. With the flatter 133 deg point the effect is opposite, a considerable increase near the chisel edge and a very slight reduction at the periphery. Thus, changing the point angle over normal ranges has a relatively slight effect on effective rake angle except in the region near the center of the drill. Hence, it is probable that the advantage of the long point (98 deg or less) for abrasive materials is due to the longer cutting edge and the flat point is useful on tough materials because the chips are thicker, resulting in higher cutting efficiency.

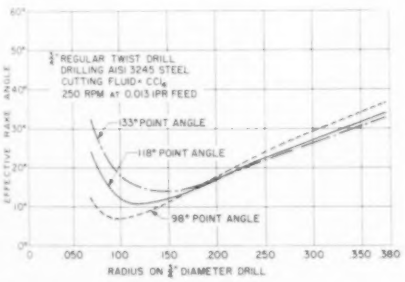


Fig. 4. Influence of point angle on effective rake angle, at various radii.

Different materials having different values of chip flow angles have some effect on the effective rake angle of a drill. The fact that the cutting edges of twist drills always have a positive effective rake angle suggests the drill is a much more efficient tool than commonly supposed.

From a paper "On the Drilling of Metals" given before the December 1953 annual meeting of the ASME.

A Dynamic Brake Motor

by Samuel Noodleman

Manager
Standard Electric Div.
Standard Dayton Corp.
Dayton, Ohio

As machines increase in complexity and the requirements for machine production are increased, it becomes necessary to stop them accurately. The problem has assumed greater importance in the last ten years and many various methods have been developed to meet it. While some use friction devices, there are certain advantages in braking with a-c squirrel cage motors. Only the magnetic field is used to obtain the braking action of the motor. Essentially such a device consists of the conventional squirrel cage motor with a standard type stator winding and a special winding which provides braking whenever it is energized directly from the a-c line.

A comparison of braking torques due to plugging, d-c braking and the dynamic brake motor operation of a typical 5 hp motor is shown in *Fig.* 1.

In comparing characteristics of these three methods of stopping a-c motors, assume an inertia load of 3 lb ft which is approximately twice the rotor inertia of a typical 5 hp motor. The plug stop would occur in 0.7 of a second, the d-c brake stop would occur in 1.3 seconds while the dynamic brake motor stop would require 1.0 second.

Even though the dynamic brake has a higher average torque than the other two methods it does not provide the quickest stopping time. During plugging the rotor would revolve ten revolutions; during the d-c braking the rotor would make twenty-six revolutions while during the dynamic brake

Typical Braking Characteristics (5 hp - 1800 rpm)

	Avg. current	Avg. torque
Dynamic brake (A)	27 Amps (220 V)	33 lb-ft
Plugging (B)	81 Amps (220 V)	27 lb-ft
D.C. braking (C)	28 Amps	18 lb-ft

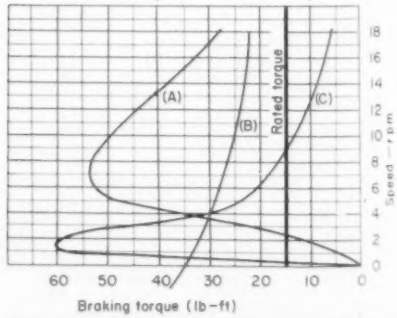


Fig. 1. Comparison of 3 types of brakes.

action the rotor would revolve eight revolutions. While the time of braking is lower for comparable average braking torques, the number of revolutions which the rotor makes during braking is less.

Since the braking torque varies as the square of the voltage, resistance inserted in the dynamic brake line will provide softer braking as desired. It thus provides the following inherent characteristics:

1. Stopping is consistent and permanent with no wear.
2. The braking action is smooth and continuous and can be readily adjusted.
3. The dynamic brake motor provides a rolling stop which makes for easy gear meshing.

Applications

Individual circuits have been designed to apply the brake motor to a variety of general purpose machines of different requirements such as drill presses, milling machines, lathes and jig borers.

The brake motor has been successfully applied for the head stock drive on universal grinders. The brake winding is controlled through a timer and is generally used whenever braking is automatically desired as power is removed from the motor windings.

The brake motor has been applied in many special machines. These include one which provides automatic drilling and tapping of small parts as they are indexed. If a part is inserted incorrectly the machine must be stopped quickly to prevent breakage of drills and taps.

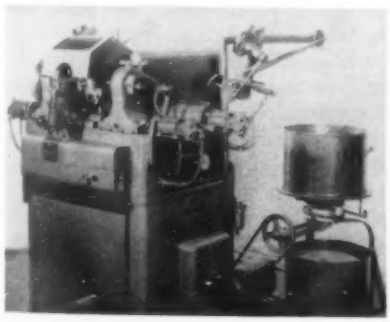


Fig. 2. Automatic armature winder.

In the automatic winding machine shown in *Fig.* 2 the dynamic brake motor serves to de-reel the wire so that it can be accurately positioned in the armature slot. These motors must start and stop accurately 20 times a minute during the operation.

Presented at The 1953 Annual AIEE Conference on Machine Tools, Cleveland, Ohio.

▼ ▼ ▼

The Waste Disposal Problem

by T. J. Powers
Supervisor
Waste Disposal Dept.
Dow Chemical Co.
Midland, Mich.

Basically waste disposal is a public relations problem. The public does not feel kindly toward a company that dumps its refuse into the river with no regard for people downstream. It is as simple as that. Industry has been accused of shrugging off pollution complaints until the pressure of bad publicity or threats of lawsuit or legislative action forces top management to order something done.

Everyone knows that laws do not solve a problem. The solution is for plant maintenance engineers to find the best and most economical answer and then sell it to top management. A law may make the selling job easier. Both water pollution and air pollution are receiving an increasing amount of legislative attention both in various states and by Congress, so plenty of help is available.

The most evident waste disposal problem is undoubtedly solids and refuse. If local markets can be developed for scrap metals, clean paper and scrap wood, that is the best solution and most profitable. Refuse burning in rotary or basket type incinerators is used by several firms. The rotary burner has proved most efficient for a large variety of hard-to-fire materials, but results in a smoke problem. Cost of incineration is estimated at $1.25 per yard of refuse. This includes handling, firing and depreciation.

Land-fill on leased or purchased land is probably the most expensive method

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of solids disposal. Selection of site must consider possible pollution of ground water. Penetration to ground water by cyanides, oils, phenolic tars or large quantities of water soluble salts offers a big risk. Cost of landfill disposal varies from $1.00 to $1.35 per yard, depending on distance hauled and method of hauling.

Smoke, fly-ash, sulphur dioxide and fume problems are still prevalent. The Manufacturing Chemists Association and American Petroleum Institute have issued guide manuals to solve the air pollution abatement situation. One of the most common solvents to abate an air-pollution problem is water, but this may create a water pollution problem.

The most spectacular complaint of industrial water pollution is the release of toxic compounds in sufficient amounts to cause large-scale fish kills. Cyanides, soluble salts of heavy metals and molecular organics are usually the cause. One definition is that water is polluted if it contains too much of any substance. The question is to adjust waste water to fit available dilution.

One of the most effective preventions or abatements of water pollution is to prevent waste. The problem in each industry varies as well as that of particular plants so that the solution has to be tailored to the individual circumstances. Food processing industries and electroplating industry have made great strides by good housekeeping and water reuse methods.

Cutting oils or coolants from machine tool industries can be broken up with acid and alum or calcium chloride at a cost of $625 per million gallons. A biologic oxidation plant has been used for wet process industry on phenols, acetic acid, milk wastes, formaldehyde, alcohols and other organic compounds. If the problem is oxygen demand in the stream, it can be made to work in a treatment plant.

Corrective maintenance is sometimes the key to control. In one instance, where acetic acid losses created a problem, it was learned that 80 percent of the loss occurred through pump-packing leaks. A different type of pump was a cheap way to solve the problem.

The plant engineering profession is faced with new laws and stronger enforcement continually. Limitations on emissions to air and composition of water waste are rapidly being established. New pollution abatement techniques are reported constantly in the literature. The remaining need is for men with courage to tackle the problems and sell the answers to top management.

From a paper delivered at the Plant Maintenance and Engineering Conference, 1954.

Technical Shorts...

COST OF FINISHED parts may be reduced by as much as 50 percent as a result of a method for bonding rubber to a nylon bearing devised by Minnesota Rubber and Gasket Co., a foremost producer of rubber O rings. Formerly, metal sleeves were molded into the rubber then an oilite bearing was inserted and the rubber surfaces were ground to dimensions.

Improved Bonding Method

With the new technique, the injection molding and bonding within close tolerances are done in one operation, with a consequent considerable savings in both materials and labor.

* * *

STUDY OF TITANIUM production at Armour Research Foundation of Illinois Institute of Technology has brought about development of a double melting process that can produce titanium-alloy ingots weighing up to 100 pounds. Most importantly, the process can be applied easily to commercial-scale production. This is a point of special interest due to industry's concern with a search for lightweight, high-strength alloys to fill the needs of jet aircraft construction.

Melting Process for Titanium

Following the steps of the process in sequence, titanium and alloying metals, such as aluminum and silicon, are fed into a nonconsumable electrode arc melting furnace. This produces an ingot containing the desired combination of metals, yet it lacks the homogeneity required to be useful.

Therefore, this ingot is forged into a rod, which is then remelted as a consumable electrode in another arc furnace. As it is fed in vertically through the top of this furnace, it melts in an electric arc which plays between it and pool of molten metal just below it.

All of the metal must pass through the intense heat of the arc, the effect of which is increased by the molten pool, which is larger and hotter than may be maintained with the other furnace. In passing through the arc, the alloying metals get dispersed throughout the mixture to form a completely homogeneous alloy.

One of the results of this extensive work, which has been going on at the Foundation since 1948, is the consumable electrode furnace of relatively large capacity. The crucible in which alloy is melted in this furnace consists of a copper tube with ¼-inch walls enclosed in a brass water jacket.

RESEARCH INTO the problem of how to conserve our nickel supply as used in alloy castings has resulted in facts which should lead to a saving of about 25 percent in the amount of nickel contained per casting.

Saving Nickel In Casting Work

Report on the results of research on this subject, which has been sponsored by the Alloy Casting Institute, was presented recently by A. M. Hall, chief of the Division of Alloy Development at the Battelle Memorial Institute.

Findings show that an alloy, designated as the HF grade, containing about

20 percent chromium and 9 percent nickel, can effectively substitute for an alloy containing about 26 percent chromium and 12 percent nickel when use is to run in the 1200 to 1600 F or intermediate temperature range. Examination points up the comparable mechanical properties of these alloys, to further justify the substitution of the lower nickel alloy for many uses.

In view of the shortage of this metal which exists, still more industrially sponsored research is under way and undoubtedly will broaden still further the knowledge of low-nickel alloys. Understandably, design engineers are reluctant to utilize a construction material without availability of complete information on its properties. Therefore, the long neglected HF alloy, which has been used but to small extent in the past, should now find a greatly increased area of application due to the extensive newly released data. Most pertinent is the fact that the cast HF alloy is usable at temperatures above those which limit the usefulness of most low-nickel alloys.

Investigating a broad series of experimental alloys, the researchers have found that the most useful range, speaking in terms of content, was this: 19 to 23 percent chromium, 9 to 12 percent nickel, and 0.25 to 0.40 percent carbon. This composition was designated the HF alloy type. In general, mechanical properties of the austenitic HF compositions in the 1200 to 1600 F range are comparable to those of the higher-nickel alloys. At 1400 F, the 100-hour rupture stress of a typical HF composition is about 14000 psi, which is the same as the representative value for the higher-nickel HH grade.

* * *

Treated Paper for Rustproofing

ENGINEERS CONCERNED with keeping metal rustproof while it is packaged will be interested in a treated preservative paper developed by Nox-Rust Chemical Corp. The paper, known as Vapor Wrapper, is treated with a chemical which stimulates an instantaneous production of protective vapor without detracting from the paper's protective properties.

Among the advantages of the development is the "instant acting" property which dismisses the necessity of an interim protection, such as preservative oils, since sufficient chemical vapor is now developed at once within the package. Formerly, similar protectively treated papers have been available, but these require as long as 72 hours to produce sufficient concentration of vapor in a package to prevent rust formation.

Who's Meeting - and Where

May 3. Cleveland Engineering Society. Invention Conference Group. Sponsor of Invention Exhibit and Conference. Contact the society, 2136 E. 19th St., Cleveland 15, Ohio, for full particulars.

May 3-5. Association of Iron & Steel Engineers. Spring conference, Bellevue-Stratford Hotel, Philadelphia. More data may be had from association office, 1010 Empire Bldg., Pittsburgh 22, Pa.

May 3-14. British Industries Fair. Annual industrial show, London and Birmingham, England. Complete information may be had from any British Consulate office in the United States, or from the British Information Office, 30 Rockefeller Plaza, New York, N. Y.

May 4-7. American Welding Society. National spring technical meeting, Hotel Statler, Buffalo, N. Y. to be held concurrently with second Welding & Allied Industrial Exposition, May 5-7, Memorial Auditorium. Contact society office, 33 W. 39th St., New York, N. Y. for more information.

May 7. Investment Casting Institute. General meeting, Hotel Carter, Cleveland, Ohio. Write for more information to I. C. I., 27 E. Monroe St., Chicago 3, Ill.

May 7-8. Pennsylvania Society of Professional Engineers. Annual state convention, Bedford Springs Hotel, Bedford, Pa. Request details from L. F. Tierney, 301 Pine St., Hollidaysburg, Pa.

May 8-14. American Foundrymen's Society. Annual convention and biennial exposition, Public Auditorium, Cleveland. Write society office for data: 616 S. Michigan Ave., Chicago 5, Ill.

May 12-14. Porcelain Enamel Institute Inc. Midyear divisional meeting, Edgewater Beach Hotel, Chicago. For facts, contact institute offices in the DuPont Circle Bldg., Washington, D.C.

May 16-19. American Institute of Chemical Engineers. National meeting, Kimball Hotel, Springfield, Mass. Institute headquarters, 33 W. 39th St., New York, N. Y., can give further facts.

May 17-19. American Institute of Electrical Engineers. Appliance Technical Conference, Morrison Hotel, Chicago, Ill. Get more details from the Institute office, 33 W. 39th St., New York 18, N. Y.

May 17-20. Basic Materials Exposition. International Amphitheatre, Chicago. Producers of the event, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y., can supply details.

May 24-27. National Office Management Assn. Sponsors of Office Machinery and Equipment Exposition at Kiel Auditorium, St. Louis in conjunction with 35th international conference. Complete details are available from NOMA offices, 132 W. Chelton Ave., Philadelphia, Pa.

June 7-10. The Society of the Plastcis Industry, Inc. Sixth national plastics exposition, Cleveland Auditorium, Cleveland, Ohio. Write to society office, 67 W. 44th St., New York, N. Y. for details.

June 9-11. American Society for Quality Control. Eighth annual national convention. Kiel Auditorium, St. Louis. Address inquiries to society office, 70 E. 45th St., New York 17, N. Y.

June 13-18. American Society for Testing Materials. Annual meeting, Sherman and Morrison Hotels, Chicago, Ill. Contact society headquarters, 1916 Race St., Philadelphia, Pa. for details.

June 14-18. American Society of Mechanical Engineers. Second U. S. Congress of Theoretical and Applied Mechanics, University of Michigan, Ann Arbor, Mich. Get details from society office, 29 W. 39th St., New York 18, N. Y.

June 14-26. State University of Iowa. Fifteenth Management Course, under direction of the school's College of Engineering, covering production planning, job evaluation, motion and time study, plant layout, quality control, etc. Write Mr. J. Wayne Deegan, 118 Engineering Bldg., State University of Iowa, Iowa City, Iowa, for data.

June 15-25. Massachusetts Institute of Technology. Special two week summer program on "Machine Tool Technology" for users and builders of machine tools; will cover fundamentals of design, use and evaluation of machine tools as well as elements of fine measurement, statistics and quality control principles. For details contact Prof. Prescott A. Smith, Dept. of Mechanical Engineering, MIT, Cambridge 39, Mass.

Sept. 14-23. Fourth European Machine Tool Exhibition, Milan, Italy. For all details concerning the show, write to Mr. E. Vandone, Manager, Unione Contruttori Italiani Machine Utensili, Via Gaetano Giardino, 4, Milan, Italy.

Field Notes . . .

Name of the firm formerly known as Sub-Zero Products Co. has now been changed to Cincinnati Sub-Zero Products Co. Manufacturers of low temperature industrial chilling machines, it makes both standard and special units.

V V V

Headquarters offices of the American Gear Manufacturers Assn. have been moved to 1 Thomas Circle, Washington 5, D. C. Formerly they were located in Pittsburgh. The new office is manned by Gerald L. Scott, staff engineer, Robert F. Klose, office manager, and J. C. Sears, executive secretary.

expansions

Tenny Engineering, Inc., now is carrying on full operations in its new plant at 1090 Springfield Rd., Union, N. J. As a result, the new plant consolidates and enlarges previous facilities housed in two older plants located in Newark. This plant, which marks the third Tenny expansion in recent years, will be devoted exclusively to manufacture of environmental equipment.

V V V

Latest of their plant expansions just recently has been completed for Detroit Stamping Co. The building enlargement of 11,000 square feet gives greater working space in shipping, storage, production and die departments plus providing enlarged and modernized general offices. The precision valve stamping department has been doubled, and the tool and die department was enlarged to include the former valve production area.

V V V

Completion of a $10-million program of expansion and modernization has been revealed by Standard Pressed Steel Co. As a result of the building of the past four years, the firm has doubled its floor space to a present 650,000 square feet. Half the expansion cost was in construction, and half in new and modern machinery and equipment. By razing some of its older buildings, and removing other walls, then erecting other building to tie into existing structures, the company now houses a new plant area under one roof with the old.

Current construction for Rockford Machine Tool Co., is rapidly bringing near completion the $600,000 assembly bay which represents the major portion of a million-dollar expansion program. The new building will increase the company's floor space by some 25,000 square feet.

V V V

Two plants are scheduled for construction this year by the Sundstrand Machine Tool Co. at a total cost of about $1,500,000. The first, which is

expected to be started this spring, will be erected between Harrison and 23rd Aves. in Rockford, Ill. will house the industrial hydraulic products division, the second plant, to be begun around mid-July, will be located on Newburd Rd. in Belvidere. It will be used for the manufacture of extra large and special machine tool products.

V V V

Manufacturing operations have now started at Micro-Precision Inc.'s new plant in Evanston, Ill. The facility, which formerly was located on Laflin St. in Chicago, is under the direction of N. Fodor, executive vice-president and general manager. The engineering department will be headed by Alexander Dreisin. Sales manager is F. J. Hoder, Jr.

V V V

Nord International Corp. has announced the opening of its new two story plant at 449 Central Ave., Orange, N. J. The main office will be located there in addition to the experimental and development departments. According to the announcement, plans also are being made to concentrate service, including repair, for the full Nord line at this location.

new offices

Morey Machinery Co., Inc., has announced the removal of the executive offices to 383 Lafayette St., New York 3, N. Y. The announcement also indicated that before the end of the year, the company expects to occupy the ground floor of the building with a modern show room where each machine tool will be demonstrated under power on the show room floor.

V V V

Opening of its sixth district office has been announced by Jones & Lamson Machine Co. It's location is Plaza Station, Charlotte, N.C. E. H. Wells, who has been representing J & L in the South for the past four years, has been named manager of the Charlotte office.

V V V

Crucible Steel Co. of America has announced the opening of a new field office in Columbus, Ohio. The office, located at 81 E. State St., was opened to provide closer liaison between the Columbus area and the Cleveland branch office. D. W. Sturges has been assigned to the office from Cleveland.

The Philadelphia office of Brown & Sharpe Mfg. Co. has moved to its recently completed building at 7 Bala Ave., Bala-Cynwyd, Pa. It continues under the direction of John J. McAlee[illegible]

v v v

The latest in demonstration facilities are incorporated in the new factory show room recently opened by The Lodge & Shipley Co. The demonstration room provides more than 2100 square feet of usable space and has direct access to the shops themselves.

v v v

Opening of a branch office at 1727 6th Ave. North, Birmingham, Ala., has been announced by Beckett-Harcum Co. Southern manager of the company, which specializes in air and hydraulic contral equipment, is H. H. Hackett who has had 12 years of experience in air and hydraulic application.

acquisitions

Stockholders of the H & B American Machine Co. and the Susquehanna Mills, Inc., have approved a merger of the two firms to form the H & B American Machine Co., Inc. Victor Nemeroff, president of H & B, was elected president of the surviving corporation, while Arnold H. Maremont and David E. Bright were elected vice-presidents.

v v v

Announcement of the purchase of the Furnace Div. of R-S Products Corp. has been revealed by Hardinge Co., Inc. Present arrangements call for the continuation of the furnace operation as a separate corporation, the R-S Furnace Corp., with its own staff of engineers with sales and engineering office at 4555 Germantown Ave., Philadelphia, Pa.

v v v

Fifty-percent interest in Vacuum Metals Corp., formerly a wholly owned subsidiary of National Research Corp., has been acquired by Crucible Steel Co. of America. By joining forces in co-ownership, the companies look forward to accelerating development of the vacuum melting of steels and other alloys. Already arrangements have been completed for an expansion program expected to increase the Vacuum Metals' capacity by more than 500 percent in the next year.

TRADE LITERATURE

For Free Booklets and Catalogs—
Convenient Request Card on Page 139

Coolants

"Recommended Coolants and Lubricants for Talide Tungsten Carbide Cutting Tools and Drawing Dies" covered in technical bulletin TB-2; includes suggested types for metalworking operations on steel, ferrous and nonferrous metals and nonmetallic materials plus lubricants for drawing wire, bars and tubes. Metal Carbides Corp., Youngstown, Ohio. **L-5-1**

Plant Modernization

"How to Get the Most Out of Capital Expenditures" deals with the problems included in plant modernization; covers data on why, how and when authorization should be given for replacing equipment; offers methods of establishing policies and procedures for such work. Illustrated. The Cross Co., Detroit 7, Mich. **L-5-2**

Drills

Line of spade and core drills displayed in brochure explaining special points and advantages of construction, performance and use. Well illustrated with cross-section, dimensional and exploded drawings; also contains data on regrinding and information pertinent to feeds and speeds. The Gairing Tool Co., P.O. Box 478, Roosevelt Park Annex, Detroit, Mich. **L-5-3**

Gaging and Measurement

"A Review of Pneumatic Dimensional Gages," paper presented by Louis Polk, company's president, at the Symposium on Engineering Metrology in London, England, offered in brochure form; covers background, theory, and general features of gaging, various types of measuring instruments for both manual and automatic gaging and their applications. Extensively illustrated. Request on company letterhead only, direct to Sheffield Corp., 717 Springfield St., Dayton 1, Ohio.

Circuit Breakers

Eight-page phamphlet "4 Ways to Improve a Modern Masterpiece" describes latest improvements in Stablok circuit breaker design; drawings help to explain operation of these features. The circuit breakers, and advantages of the new features. Federal Electric Products Co., 50 Paris St., Newark, N.J. **L-5-4**

Superfinishing

Catalog records progress of Superfinishing process; includes description of this work, specification for the company's 12 machines and 5 attachments available for it, plus information and illustrations on 28 different job aplications. Form 1169. Gisholt Machine Co., Madison 10, Wis. **L-5-5**

Milling

Clarkson Operator's Slide Rule, which gives proper speeds and feeds for milling operations, includes readings for mild, medium and tough steels, cast iron, phosphorous, bronze, brass and aluminum. Clarkson, Inc., 320 Ontario St., Toledo 2, Ohio. **L-5-6**

Steel

"Ten Cold Finished Jalcase Grades" of free-machining open hearth steel are described as to mechanical properties, machinability, heat treatment, chemical analysis, distortion and wear resistance. Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa. **L-5-7**

Power Tools

Condensed specifications folder catalogs principle Delta tools for the metalworking industry, describing each in detail; includes several accessories. Reverse side points out advantages in production applications. Unfolds to 17 x 22 in. wall chart for handy reference use. Delta Power Tool Div., Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. **L-5-8**

Gaging

Illustrated brochure 54 only deals with Micro-Lap precision gages, indicating and gaging fixtures and Acro-Grip adapter bushings; also offers informative discussions on gages and gaging practices with charts and drawings of clarification. H. C. Clatfelter Co., 21810 Wyoming Ave., Oak Park 37, Mich. **L-5-9**

Metal Cutting

Pocket-size booklet offers "how-to" information covering hand, power and band sawing; discusses choosing proper blade for specific use and lists precautions to be observed. Outlines typical problems in sawing metals and their solutions. Includes recommended cutting speeds for various metals and other materials. Victor Saw Works, Inc., Middletown, N. Y. **L-5-10**

Engineering Developments

1953 Annual Review of engineering developments is presented in extensively illustrated brochure offering details on company's work in power generation and distribution, general industry, metals, national defense, stone products and coal, chemicals and petroleum, research and operations abroad. Request on company letterhead only, direct to Allis-Chalmers Manufacturing Co., Box 512, Milwaukee 1, Wis.

Coolant

Pocket-size brochure offers 38 pages of information about Trim coolant covering its properties, cutting fluid action, effect on various kinds of metals, microstructure, practical applications and many other points. Master Chemical Corp., 13 N. Huron St., Toledo 1, Ohio. **L-5-11**

Gear Grinding

Eight-page illustrated catalog presents line of automatic gear grinding machines plus information and specifications of gears, splines and special contoured parts that can be ground on them; describes and pictures special features and advantages. Request on company letterhead directly to The Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich.

Screw Threads

Fifty-two page brochure contains handbook type information pertinent to screw threads; includes tolerances, basic points in thread measurement, a discussion of the Unified Screw Thread System, tapping speeds, lubrication; clearly illustrated with drawings. Request only on company letterhead directly to Greenfield Tap and Die Corp., Greenfield, Mass. Specify whether delivery by mail or in person is preferred.

Titanium

Folder describes unalloyed titanium produced by company's double melting process; contains outline of properties, recommended techniques for fabricating and forming sheet; machining and welding characteristics. Mallory-Sharon Titanium Corp., Niles, Ohio. **L-5-12**

Steel

Thirty-four page booklet "Allegheny Metal in Chemical Processing" covers use of stainless steel in manufacture of acids and other chemicals in various industries; includes corrosion resistance data, fabricating information and a stainless steel finder showing comparative properties of Allegheny metal types. Request directly from Allegheny Ludlum Steel Corp., Advertising Dept., 2020 Oliver Bldg., Pittsburgh 19, Pa.

Special Metalworking Machines

Details and illustrations of 18 representative special machines included in 28-page looseleaf catalog dealing with specialized production equipment; also shows tooling, and parts processed by each piece of specialized equipment. Catalog design permits inclusion of future supplement looseleaf inserts to keep material up to date. Peerless Production Co., 19449 Glendale, Detroit, Mich. **L-5-13**

Alloys

Alloy Reference Chart lists chemical analyses, physical properties and recommended applications for 28 different grades of cast stainless steel; also indicates ACI, AISI, SAE, ASTN and general type designations, plus comments on weldability and machinability. The Cooper Alloy Foundry Co., Hillside, N.J. **L-5-14**

Fasteners

Thirty-six page catalog "Better Fastening for Better Products," designed to assist industry in the engineering and wise selection of fasteners for its products, offers data on physical characteristics and ASA dimension standards for each type; gives all specifications on various styles of hollow set screws, combined into one chart; includes size and price charts. The Jayme Organization, Inc., Heights-Rockefeller Bldg., Lee and Mayfield Rds., Cleveland 18, Ohio. **L-5-15**

Tool Steel

Technical data concerning two bulletin sheets offer technical data on (1) Extra, a water-hardening carbon tool steel, and (2) Sterling V, a water hardening carbon-vanadium tool steel; includes information on characteristics, typical analysis, typical applications, forging, general heat treatment, anealing and tempering. The first is covered in Tech-Data 20-280, the second in Catalog Section 20-260. Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa. **L-5-16**

Readers' Viewpoints

. . . metal spinning formula

To the Editor:

In the March issue of THE TOOL ENGINEER I read an article on metal spinning in which a formula is given for determining the blank diameter of spun shapes. Twice the diameter and height of the finished shell would give from 40 to 60 percent too much material. A formula that I have found to be best, next to calculating square inches of surface and converting area to a circle, is:

$$D_b = 2\sqrt{dw + r^2}$$

where

D_b = Blank diameter, inches

d = Finished shell diameter, inches

r = Finished shell radius, inches

w = Finished shell height, inches

This applies to a straight side shell. For an odd shape, draw two straight lines from the largest to the smallest diameters on the two opposite sides and use the mean diameter for the calculation.

Arthur Brook, ASTE Senior
Spinning & Hydroforming
Research Specialist
Culver City, Calif.

. . . . reader interest

To the Editor:

During the course of each year I visit many metalworking plants. While waiting in the reception rooms, I have read more than a library full of trade journals.

Seldom have I seen a new or old copy of THE TOOL ENGINEER. Why? Is it because your readers hoard them? If so, it would indicate your publication is in a class of distinction.

If your readers tend to retain their issue, and perform saturated reading, as is indicated, your advertising accounts are receiving a premium.

As an occasional guest writer for your publication, I feel I have the attention of your subscribers and that is where my interest lies. I thought you might like to hear of my observations.

Edward Engel
Consulting Engineer
Philadelphia, Pa.

Men at Work . . .

In order to concentrate on the engineering services activity now expanded by the Chambersburg Engineering Co., that firm has announced reassignment of operational functions. **Eugene C. Clarke, Jr.**, vice-president, has been advanced to general manager of the company; **Kenneth W. Palmer**, now advanced to vice-president, also continues as treasurer; **C. Douglas Galloway, III**, who now is secretary is also made works manager; and **George H. Martin** is foundry superintendent.

William D. Gross, works manager at Crucible Steel Co. of America's Spaulding Works will retire effective May 31. At the same time, announcement was made of the appointment of **Paul A. Karns** to succeed Mr. Gross upon his retirement. Mr. Karns recently was associated with John A. Roebling's Sons Corp. as manufacturing manager of the Cold Rolled Products Div.

Mr. Gross retires after being associated with Crucible Steel since 1913 when he was hired as a chemical engineer.

Adm. Paul F. Lee, U.S.N. (Ret'd.), has been named recipient of the American Gear Manufacturers Assn.'s 1954 Edward P. Connell award. This award is presented not oftener than once annually to an individual who has made noteworthy contributions to the gearing art and industry. Adm. Lee, who has been vice-president of Gibbs & Cox, Inc., since his retirement in 1948, was named for his contributions to the design and manufacture of naval gearing which were of "enormous aid to the gear industry and to the successful ship building program that enabled us to win the war."

Harold E. Martin has been named division superintendent of the recently created metal cutting tool division of the Brown & Sharpe Mfg. Co. In this capacity, Mr. Martin will be in charge of cutter manufacturing, hardening and engineering departments and the cutter office.

Three more partners have been taken into the firm of Metcut Research Associates: **John Maranchik, Jr.**, was named manager of the metallurgical processing division; **Leonard J. Nowikowski** became manager of the production engineering division; and **Walter H. Friedlander** was made manager of the industrial engineering division.

Appointment of **C. Harold Anderson** as chief engineer has been announced by The Bullard Co. Mr. Anderson, who first joined Bullard as a draftsman in 1920, has been serving as assistant chief engineer for the past four years.

Three of the operating personnel at Reliance Electric & Engineering Co. have been given new responsibilities. **Fred E. Harrell**, vice-president, has been given additional duties of director of special projects; **Hugh D. Luke**, formerly manager of central production planning, now is manager of manufacturing of rotating equipment. **Stephen W. Feiss**, previously a manufacturing staff project engineer, was appointed general superintendent of the company's Ivanhoe Div.

Edward H. **Farmer** is the plant manager of E. W. Bliss Co.'s recently-acquired San Jose, California works. Prior to this appointment, he was works manager at Lockheed Aircraft Corp.

C. Paul Porterfield has been elected vice-president and general manager of The Method X Co., an affiliate of Firth Sterling Inc. He previously held the position of chief engineer with the company.

Alexander Blakely has been appointed vice-president in charge of manufacturing for the Metal Removal Co. Dr. Blakely, an authority on grinding problems, was formerly with Vesuvius Crucible Co.

Louis J. Baudis was elected vice-president in charge of manufacturing and director of The Bullard Co. A veteran of 29 years with the company he most recently served in the capacity of chief engineer.

A new plant manager for Benchmaster Manufacturing Co. has been announced by the company president. **Lance Mosdell**, now in charge of plant operations and enlarging present facilities in a new plant expansion program, was formerly associated with Heckman in St. Louis, and Sperry Gyroscope of New York.

Appointment of **R. F. Allen** as assistant to the executive vice-president has been announced by H. K. Porter Co., Inc. Mr. Allen comes to Porter with 24-years experience in management and will assist in all phases of operation of the company and its various divisions.

Announcement from Rockwell Manufacturing Co.'s Nordstrom Valve Div. has made public the appointment of **Terrence H. M. Taylor** as chief engineer of the division. Mr. Taylor was formerly research scientist with the U. S. Atomic Energy Commission.

Officers and directors of the recently founded Investment Casting Institute include **K. M. Bartlett**, of Thompson Products, Inc., new president of I.C.I.; **Ted Operhall** of Misco Precision Casting Co.; **W. A. Dubovich** of Engineered Precision Casting Co.; **Ken Yonker** of Howard Foundry Co.; **R. S. Banister** of Midwest Foundry; and **R. D. Gumbert** of Alloy Precision Casting Co.

Garvin A. Drew has been appointed vice-president of Scoville Manufacturing Co., Inc., in charge of sales, service, advertising and sales promotion for A. Schrader's Son Div.

Abstracts of Foreign Literature

By M. Kronenberg

Machining by Electronic Rays

A survey by J. Hinnuber and O. Rudiger covers the most important previous attempts to machine metals and other substances by chemical, electrolytical and electric arc methods. The survey is published in the February, 1954 issue of *Werkstatt und Betrieb*.

They have come to the conclusion that none of the earlier methods offers any special advantage to European industry, considering cost. A detailed investigation dealing with a method of employing spark discharges in a condenser circuit without arc formation is also discussed. They describe the instruments, their application and tests run with this physical-chemical method but again come to the conclusion that an economical advantage exists only in special cases.

When increasing the frequency of discharge to 3000 cycles per second, however, as is customary in the United States, the situation changes entirely. In such case the penetration can be increased 10 to 15 times although power consumption increases only four times, namely, from 3 kw to 12 kw.

The authors specifically discuss the application of supersonic machining methods to the drilling of fine holes and the use of electronic rays in the watch industry. The electronic method is very fast, as indicated by the fact that it is possible to produce holes of 0.0003-inch diameter and a depth of ¼ inch in ruby in as little as 10 to 20 seconds.

Load Distribution in Radial Ball Bearings

A mathematical treatise on load characteristics and distribution in radially grooved ball bearings has been published by E. Meldau in Issue No. 2, 1954 of *Werkstatt und Betrieb*. Diagrams give significant data for the load on balls for bearings free from play and for those where a certain amount of clearance is admitted. The formulas also enable one to calculate the maxi-

mum ball load, the equivalent bearing load and the position and direction of the resultant force.

Power required in Drawing Operations

New data for the calculation of forces involved in pressing operations have been presented by H. Maekelt in an article published in the same issue of *Werkstatt und Betrieb*. These data, which are represented both as formulas and in graphs, refer to cutting of sheet metal, punching of holes, U and V bending operations, deep drawing, stretching, extrusion, cold forming and stamping.

Other tables can be used for finding the hold-down forces for deep drawing of sheet metal and for ascertaining a correction factor for determination of the specific pressure in relation to the tensile strength of the material.

Application of related monograms is shown by means of practical examples including determinations of efficiency and productive capacity of various presses.

Electro Mechanical Finishing

A press-finish method employing carbide blocks and an electric current was developed a few years ago in Russia according to a report in Issue No. 1, 1954 of *Werkstattstechnik und Maschinenbau*. This report refers back to a publication in *Vestnik Masinostroenija* in 1951 by B. M. Askinasi. Described is an interesting operation in which a carbide block, elastically suspended, is pressed against a workpiece on a lathe in order to obtain a high surface finish. A high current of low voltage is applied to the contact area of workpiece and carbide block causing a considerable heating of serrations left from a preceding turning operation. The peaks of these serrations are thus folded over into the grooves producing a smooth surface on the workpiece. The pressure required for this operation is relatively small. The article contains details of the determination of pressure and also of the tool life of the carbide blocks. The wear of these carbide blocks is small.

A change in the feed rate affects the quality of the surface produced when finished in this way. The surface speed, on the other hand, has no noticeable effect on quality within the range of 30 to 300 fpm. The hardness of the finished surface increases under load. Wear tests indicated that surfaces treated by this electro mechanical finishing method have better wear qualities than ground surfaces. The surface roughness measurements which

are obtained vary between 0.0006 and 0.0012 inch. The author claims that considerable time can also be saved by his method because finishing operations can be carried out on the same lathe as the preceding roughing cut.

Shot-peening of Cutting Tools

According to the same issue of *Werkstattstechnik und Maschinenbau* shot-peening has been applied to cutting tools by N. A. Karasev as reported in the Russian magazine *Stanki i Instrument*, Issue Number 10, 1952. The author tested the quality of twist drills, tapping tools and reamers after such treatment by measuring microstructure, hardness and tool life. The following conclusions were obtained: (1) The increase in surface hardness due to shot-peening reduces the tendency of the chip to stick to the cutting edge and to the flanks of the tool; (2) cutting forces are reduced; (3) the cutting edge is not deformed by shot-peening, lapping is not required; (4) the optimum time for shot-peening application is 2 min for plane surfaces and up to 15 min for cylindrical surfaces; (5) increase in tool life varied between 50 and 300 percent and was particularly noticeable in deep-hole drilling with twist drills.

Induction Heating

The development of induction heating methods in Europe is described in an article by G. W. Seulen in the January, 1954 issue of *Werkstattstechnik und Maschinenbau*. After discussing the differences of induction heating compared with other methods of heating metals, the author's paper deals with the effect of permeability, thermal conductivity, frequencies and the geometrical shape of the inductors. Results of tests are presented in the form of diagrams showing the relationship between temperature distribution and dimensions of the workpiece at various frequencies. Likewise, tests are analyzed showing that with the same frequency it is possible to cause heat concentration in the surface of the workpiece, under certain conditions, as well as well-distributed heat patterns over the entire cross section.

The author also gives data on the economical side of induction heating and includes numerous illustrations of recent developments.

A discussion of induction heating problems with questions and answers follows the article. Some of these questions were received from France, Switzerland and Belgium. They cover frequency problems, materials that can be induction heated, sizes of transformers required and similar items.

good reading

MODERN ELECTROPLATING. *Edited by Allen G. Gray. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price $8.50. 563 pp.*

Contained in this book is a recent source of electroplating practice. Basic theory, in addition to the practical aspects, is emphasized. Virtually all of the current practices are discussed.

Included is a chapter on the uncommon metals in which the literature is reviewed to bring the reader up to date on the status of electrodepositing of metals that are not now commercially plated. The problem of plating on aluminum and magnesium is also considered. References and bibliography follow each chapter.

PROCEDURES IN EXPERIMENTAL METALLURGY. *By A. U. Seybolt and J. E. Burke. Published by John Wiley & Sons, 440 Fourth Ave., New York 16, N.Y. Price $7.00. 340 pp.*

Included in this book are the steps from preparation or selection of the base metal to be used through principles of alloying, melting without contamination, casting, fabrication into rod, sheet or wire, and heat treatment to obtain a desired structure.

Among the subjects discussed are: methods of obtaining high temperatures, measurement of high temperatures, control of temperatures, refractories, melting and casting, heat-treating techniques, fabrication of metals, powder metallurgy, preparation of pure metals and single crystals.

GAGES AND PRECISION MEASUREMENT HANDBOOK. *By John G. Jergens. Published by John G. Jergens, 18107 Invermere Ave., Cleveland, Ohio. Price $1.67. 200 pp.*

Contained in this pocket-size handbook are rules, formulas, tables, etc., in most common use by tool engineers, tool designers and tool makers. All subjects are explained and fully illustrated. A glossary defines terms used in the tool field.

WELDING ENGINEERING. *By Boniface E. Rossi. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. Price $8.00. 786 pp.*

This book familiarizes the student with fundamentals, gives those in the field a wider understanding and provides a source of reference for draftsmen, designers, engineers and researchers. Treatment is technical and practical.

Recent developments are covered, including several subdivisions of inert-gas-shielded and submerged arc welding. Also discussed are certain phases of inert-gas-metal arc welding with consumable electrode, such as semi-automatic process; certain phases of metal-arc welding, such as contact-arc and multi-plus-arc welding.

EXPENDITURE, EFFICIENCY AND ECONOMY OF MODERN TOOL MACHINES. *Published by W. Girardet Publishers, Gerswida St. 2, Essen (Ruhr), Germany. Price $8.64.*

This book contains lectures of research work in laboratories for machine tools and curriculum of the Rhine-Westphalian Technical College of Aachen, Germany, as well as references of leading techniques in practical and scientific applications. Attention is given to constructive tendencies in the manufacture of foreign machine tools.

THE SCIENCE OF PRECISION MEASUREMENT, *Published by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Price $3.50. 258 pp.*

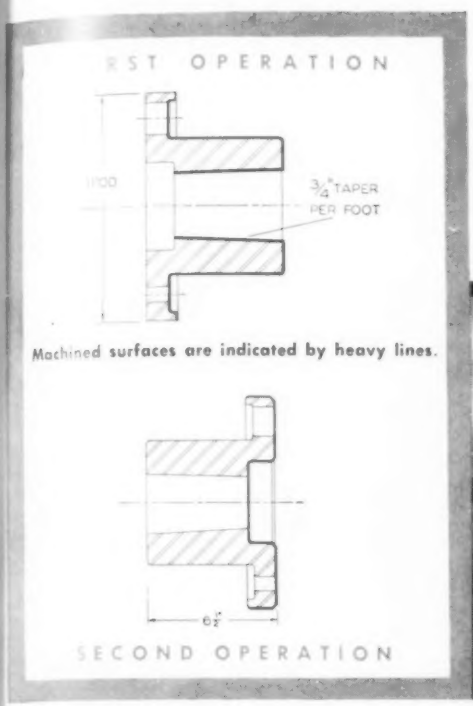
This book combines the history and development of gaging and dimensional quality control with types and applications of DoAll products. Findings resulting from research have been reduced to simple diagrammatic presentations to make scientific fundamentals understandable. A glossary and numerous tables related to precision measuring are included.

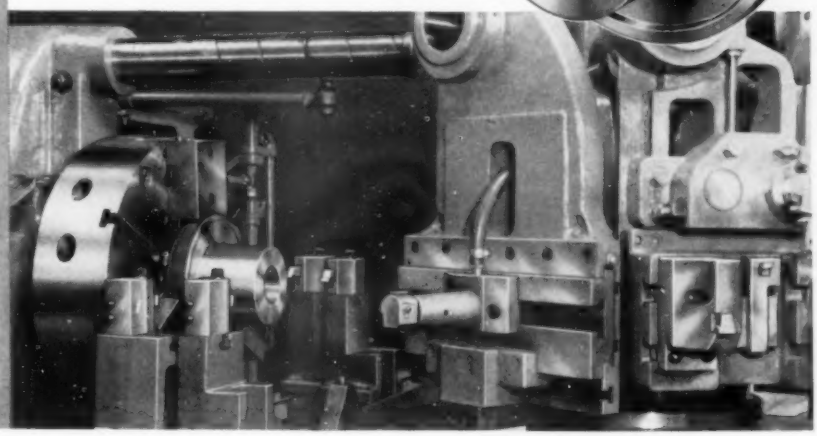
MATERIAL HANDLING. *Booklet No. 3. Published by the Material Handling Institute, Inc., 813 Clark Bldg., Pittsburgh 22, Pa. Price 50¢. 12 pp.*

The proper relationship between material handling and other functions in an industrial organization is explained in this booklet. General rules for analyzing work-volume and work-density are presented with an example in chart form of work-volume analysis.

How to TAME a TOUGH FORGING

PRECISELY ECONOMICALLY AUTOMATICALLY





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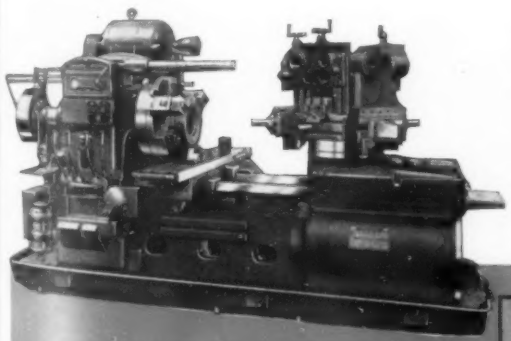
This 11" diameter steel forging required power to drill the 3" diameter hole through from the solid and to remove stock rapidly for final precision size turning. The P & J 6 DRE finished the piece in two operations, performing the machining of the tapered bore by using a single-point slide tool. The most effective speeds and feeds for each operation were preselected and automatically repeated. An automatic air-operated chuck increased output with less operator fatigue. More machines were handled by each man.



This is a typical example of the way P & J Tooling has helped others, and can help you take full advantage of the profitable productive rates possible with this automatic. Let us be on your side working for profits. Send for your copy of Bulletin 128, or call your nearest Pratt and Whitney branch office. Tooling recommendations and production estimates will be yours at no obligation.

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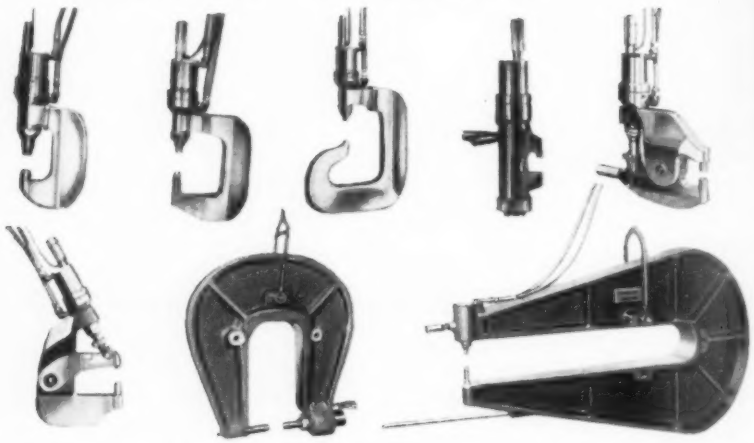
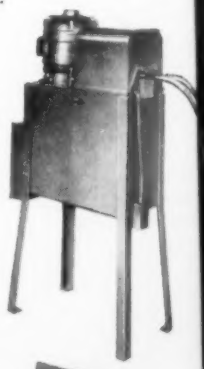
Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

2 They mount the cylinders in Hannifin "C"-Frames



The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

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Tool Steel Topics

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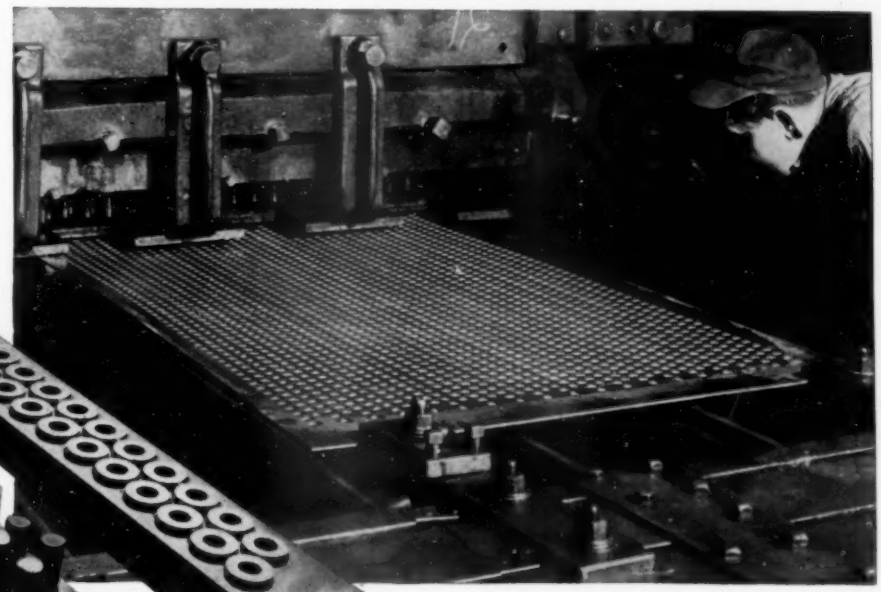
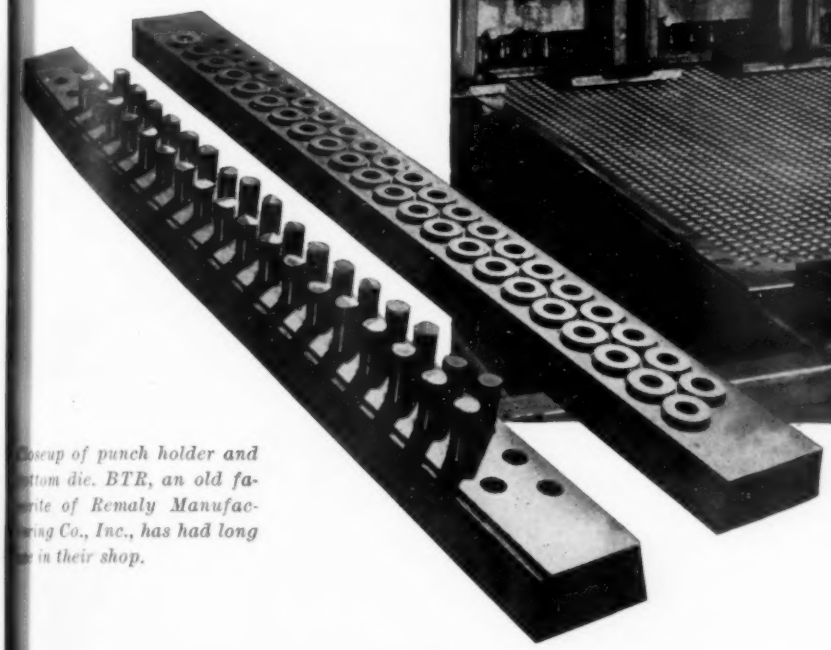


NOTE: Die can simultaneously punch 39 holes 13/16 in. in diameter in 36-in. carbon-steel plate as it stamps screen segment for coal producer.



Closeup of punch holder and bottom die. BTR, an old favorite of Remaly Manufacturing Co., Inc., has had long use in their shop.

Dies made of BTR take big bites in making screens for coal producer

It's interesting to watch some of the operations performed in the shop of the Remaly Manufacturing Co., Inc., Tamaqua, Pa. For example, here's a typical job handled by this 90-year-old firm. They set up a punch holder and dies in a 900-ton press, feed in 6-gage carbon steel plate, or sometimes stainless, or manganese-bronze. Then, Boom! Boom! Boom! In less time than it takes to tell, they've punched a large screen segment for use in sizing anthracite coal.

What steel do they use for the dies? It's Bethlehem BTR, an old standby with Remaly. One day we asked them what they liked best about BTR for making screen segments. Wear-resistance? Shock-resistance? Low distortion? Good machinability? Fast, easy heat-treatment? "It's hard to put a finger on any one of those points and say it's best," answered Bill Yost, one of the heads of the firm. "In our shop, we like BTR on all counts. It stands up well. In fact, I can't remember ever having trouble with it."

BTR (Bethlehem Tool Room) is our general purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Its outstanding characteristic is its safe-hardening property. It has the happy combination of abrasion-resistance and toughness, making it an ideal steel for tool-and-die applications where long wear is essential.

Your nearest Bethlehem tool steel distributor has a good stock of BTR on hand and is at your service. Give him a call at your first opportunity.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Punch All the Way Through

The tool life of punches can be greatly improved by proper control of the stroke of the punch. It is not necessary for a punch to go completely through the hole being punched, for when it does, rapid wear occurs. The wear increases clearance, which in turn increases the load necessary for punching and also results in burred edges.

When a punch has penetrated part way through the stock, "snapping" occurs and the "button" pops out. How far the punch penetrates before snapping takes place depends upon the material being punched and the thickness of the stock. Generally, the softer the material the greater the penetration required. Conversely, a hard or brittle material requires less penetration.

Penetration on soft, thin stock may be as high as 90 pct of the stock thickness, and on hard, thick stock, as low as 40 pct. The less penetration required to bring out the button, the better. What the penetration should be must be determined empirically on each job. Control of punch penetration by adjusting the press stroke means decreased punch-wear, better quality parts and increased tool life.

for Precision

+ Low Cost:

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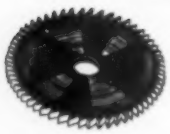
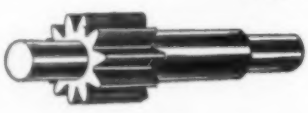
Mikron Hobbing Machines Excel Where High Precision Machining Standards Must Be Maintained

• **MIKRON No. 79** is an excellent choice for small spur gears and pinions. It is simple to operate, to set-up and to change-over from job to job. CAPACITY: Gears, max. dia. $1\frac{9}{16}$"; max. length of cut $1\frac{1}{8}$"; number of teeth 6 to 390; pitch DP 26 and finer.





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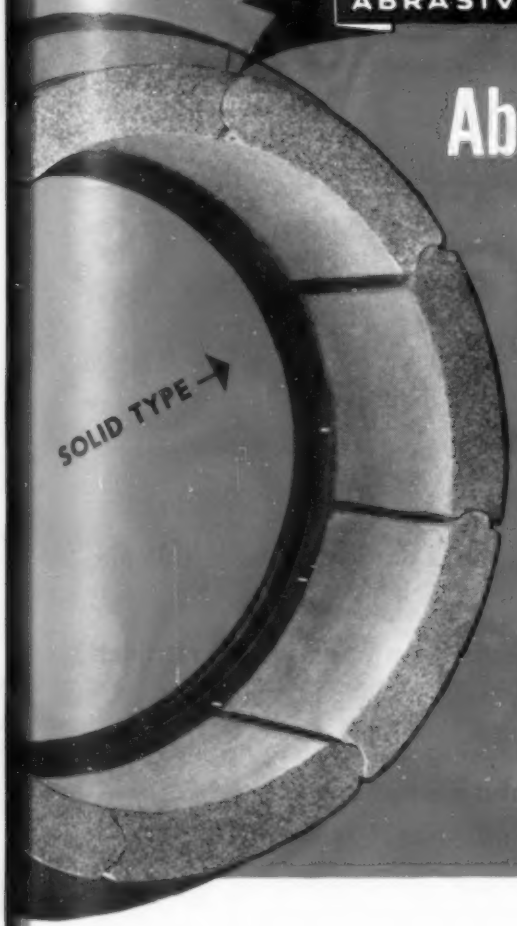

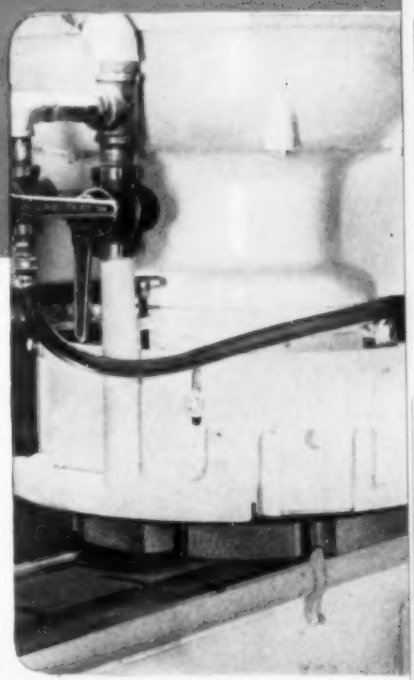

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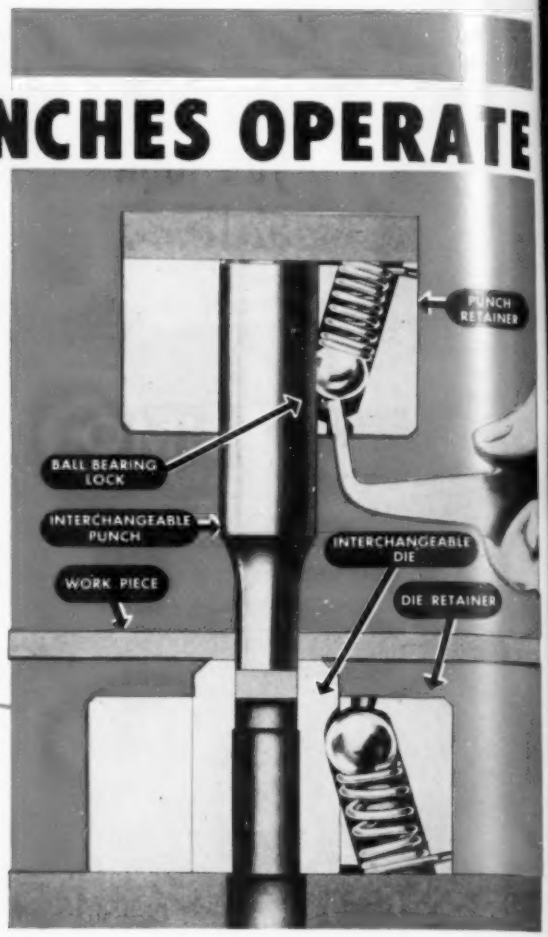
HOW R-B PUNCHES OPERATE



R-B standardized punches and die buttons are inserted in their retainers with a simple push and a twist.

Punches and die buttons are instantly removed by inserting a tanged tool in retainer hole to release the locking ball.

Each R-B retainer is equipped with a spring-loaded locking ball which engages the recessed portion of standard and special R-B punches and die buttons. Locked punches and die buttons are always accurately aligned—no additional keying is required.

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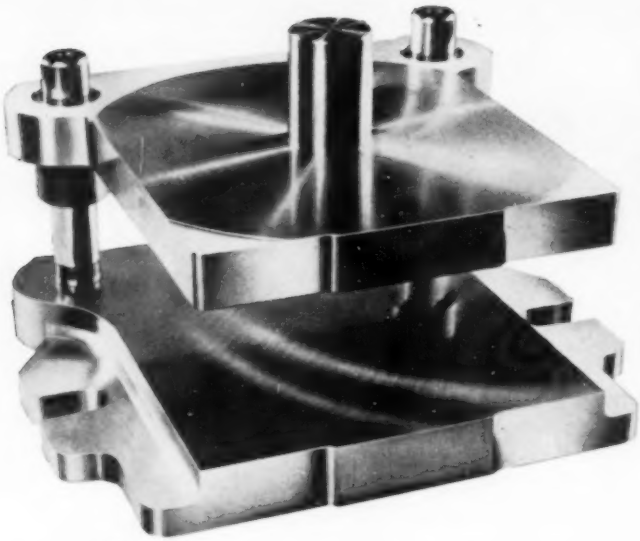

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The company uses a 10 KW Lindberg unit for the production soldering of flanges to coil springs in the manufacture of torsion spring assemblies. The time cycle is 11 seconds for each assembly.

Production has been increased to 125 assemblies an hour . . with one girl operating the equipment. This is an hourly increase of 40 assemblies over the former method where soldering was done by a team of three men using gas torches. And the hourly per-operator production is up from 28 to 125!

With the induction heating unit, there are no open flames from gas torches. No extra exhaust fans are required . . there is little danger of burns to operators . . fire hazards are virtually eliminated!

And there is a substantial economy of floor space! Formerly the three torch operators required more than 60 square feet of floor space . . but the Lindberg Induction Heating Unit requires less than 30 square feet.

If your requirements call for production soldering, brazing, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

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HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY,
2450 West Hubbard Street, Chicago 12, Illinois

GEARS NOISY?
...Of Course

The Gear Business has always seemed to attract colorful and positive characters. Like George B. Grant, the Dean of Gear Makers in the Gay Nineties.

Sixty years ago he gave industry a few gems of philosophy in what he referred to as his Treatise on Gears.

For Instance:

"Noise: at a high speed is unavoidable. Fibre gears are quieter and softer than metal, and raw-hide is still quieter and less durable. Raw-hide and fibre are good at high speed, but unsuitable for heavy strains.

I Am Not Responsible for Any Mistake: even if I make it myself, if it could have been prevented by sending me working drawings or good sketches. If you make me guess, you must take the responsibility. A poor drawing is better than none.

Unless Otherwise Described: every gear ordered is a cut spur gear of cast iron, and it will have such diameter, pitch, face, hole, hub, and quality as I happen to think most desirable. Describe what you want and that you will get, but if you omit any detail I may write to you for the information required or I may guess at it and go ahead.

A Fit: is guaranteed only when I have the parts to be fitted. I ream a hole with a one inch reamer, for example, but do not guarantee that it will fit your one inch shaft.

Estimates: As a rule nothing is saved by getting an estimate. A low price means a cheap piece of work, here or elsewhere.

Steel Castings: are generally full of blow holes, and it takes a long time to get them. A cast iron gear of wider face is as strong and cheaper."

If Mr. Grant could only have run a sound test on RED RING Shaved Gears.

6778

NATIONAL BROACH & MACHINE CO.

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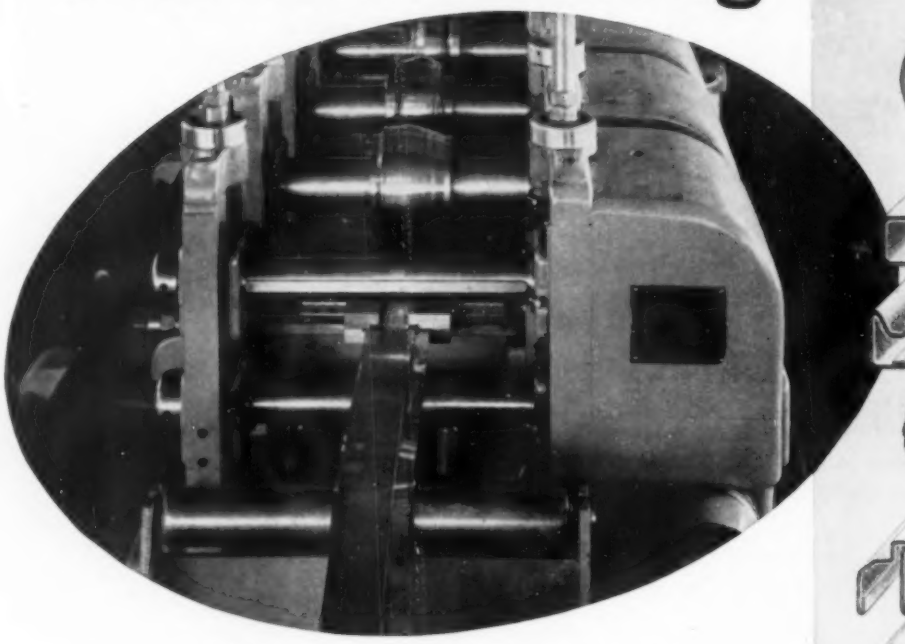

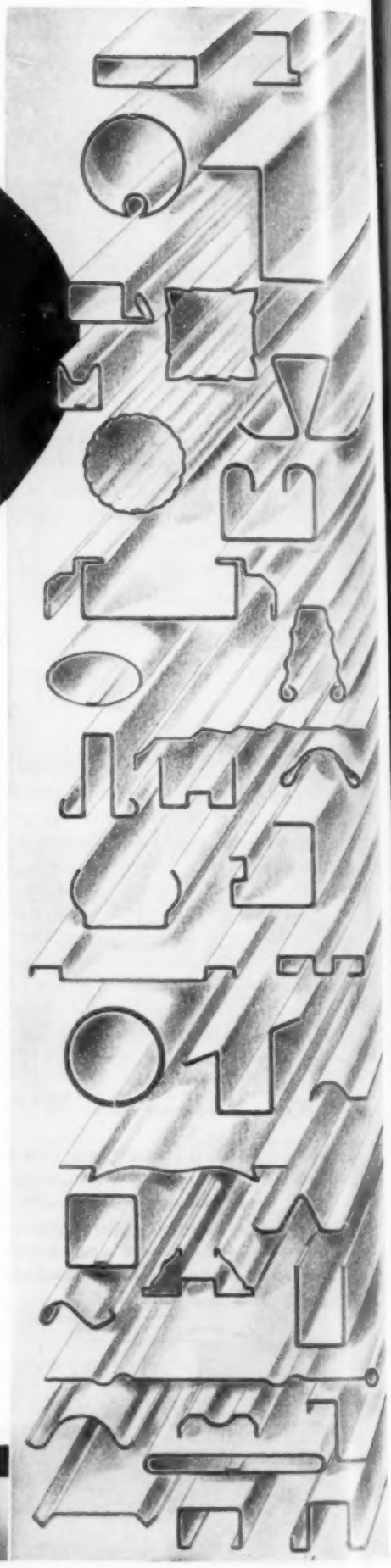

for *higher production,* at greatly reduced cost

If you make anything that can be cold-roll-formed in fair quantities, you may be sure it will mean either higher production or greatly reduced cost, or both. Moreover, because roll-formed shapes can be designed for highest strength-weight ratio, this method often affords material savings exceeding the entire conversion cost.

There may be some operation in your plant where cold-roll-forming would prove more economical than present methods; or you may be buying components made by other methods, which you could make yourself at greatly reduced cost. Sometimes other operations, such as curving, coiling, embossing, perforating, welding, etc., can be combined with roll-forming at little or no extra cost. In any case, feel free to consult Yoder engineers as to practicability and cost of applying a cold-roll-forming machine to any operations you have in mind.

The Yoder Book on Cold-Roll-Forming may prove of interest to you. It's yours for the asking.

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Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
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- ★ PIPE and TUBE MILLS - cold forming and welding

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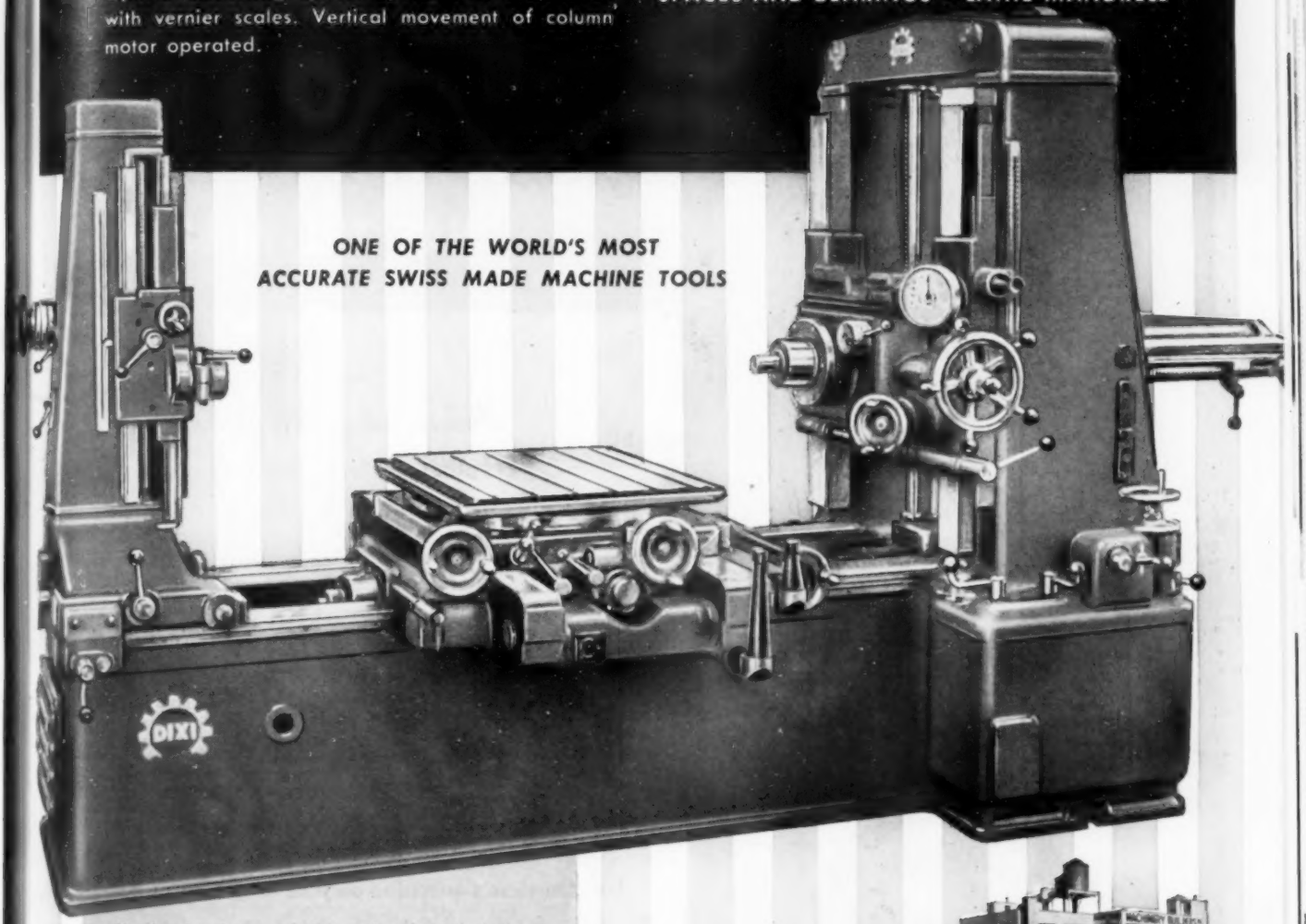

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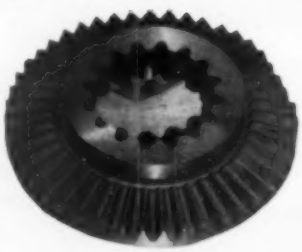

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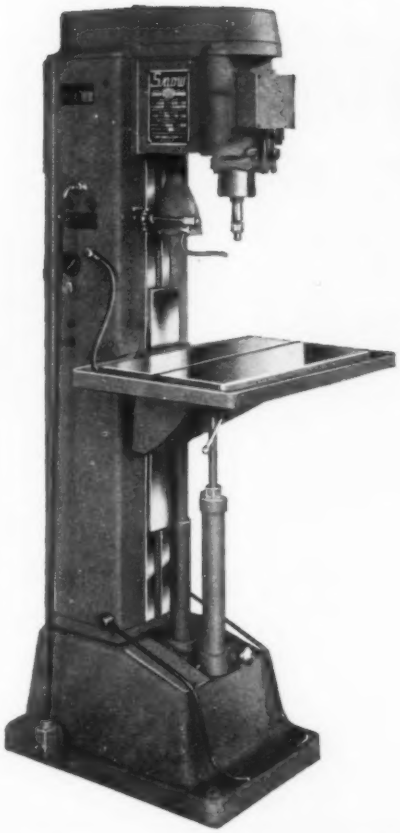

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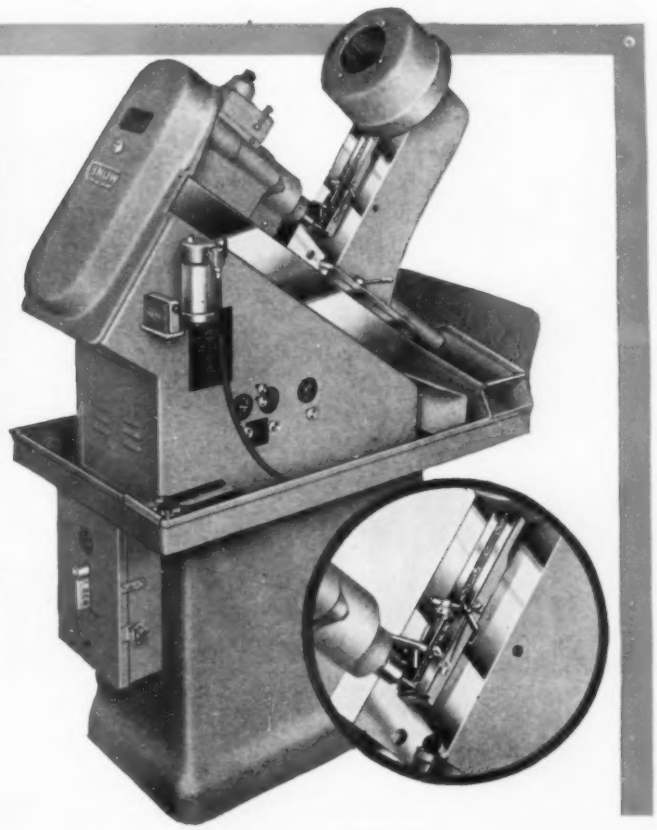

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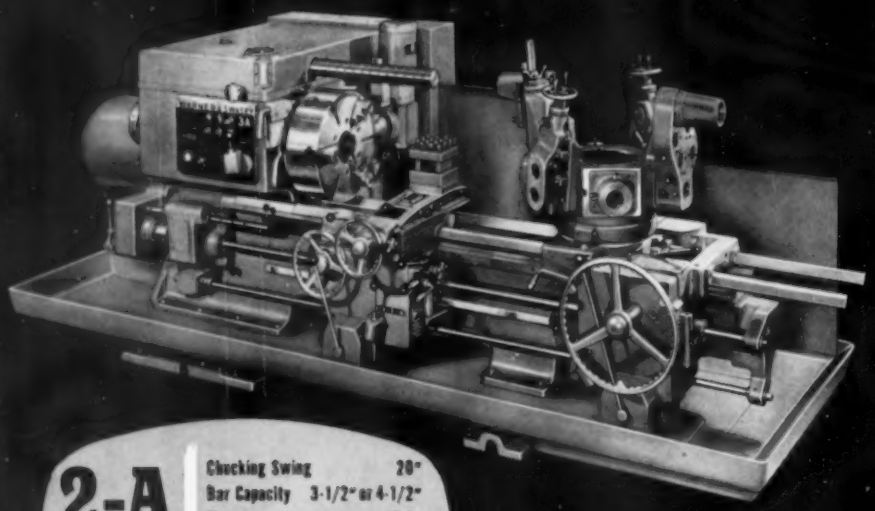
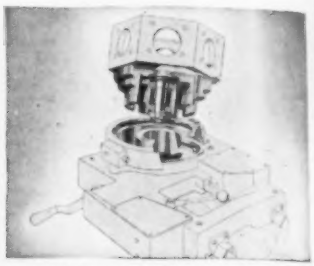


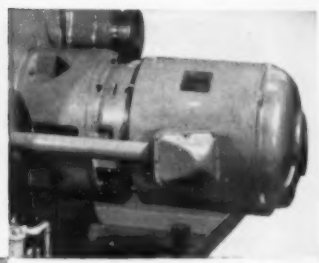
2-A	Chucking Swing	20"
	Bar Capacity	3-1/2" or 4-1/2"
	Motor	40 hp
3-A	Chucking Swing	23-1/2"
	Bar Capacity	4-1/2" or 6"
	Motor	60 hp
4-A	Chucking Swing	28-1/4"
	Bar Capacity	9" or 12"
	Motor	75 hp

New 1-A also available



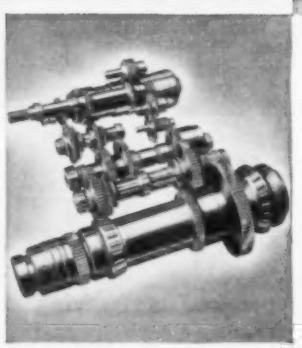
ACCURATE LOCATING AND LOCKING HEX TURRET assures maintained accuracy. Single lever controls both locating and clamping of turret.

INCREASED STRENGTH WITHOUT INCREASED WEIGHT. Scientific diagonal rib design gives over 30% added strength—greater rigidity and long-term accuracy.



MORE POWER – as much as you'll need for any job! Motor range: 2-A, 15 to 40 hp.; 3-A, 25 to 60 hp.; 4-A, 30 to 75 hp.

SPEED PRE-SELECTION made easy by large direct reading indicator dial. AUTOMATIC GEAR SHIFTING boosts production, reduces operator fatigue. A single movement of the control handle without any further attention by the operator slows spindle to crawl speed, then shifts to new speed—all in a matter of seconds.



16-SPEED DRIVE provides closer grouping of speeds in natural work range to turn more work diameters more effectively – increase production and tool life. 2-speed motor provides 32 *un-duplicated* speeds!

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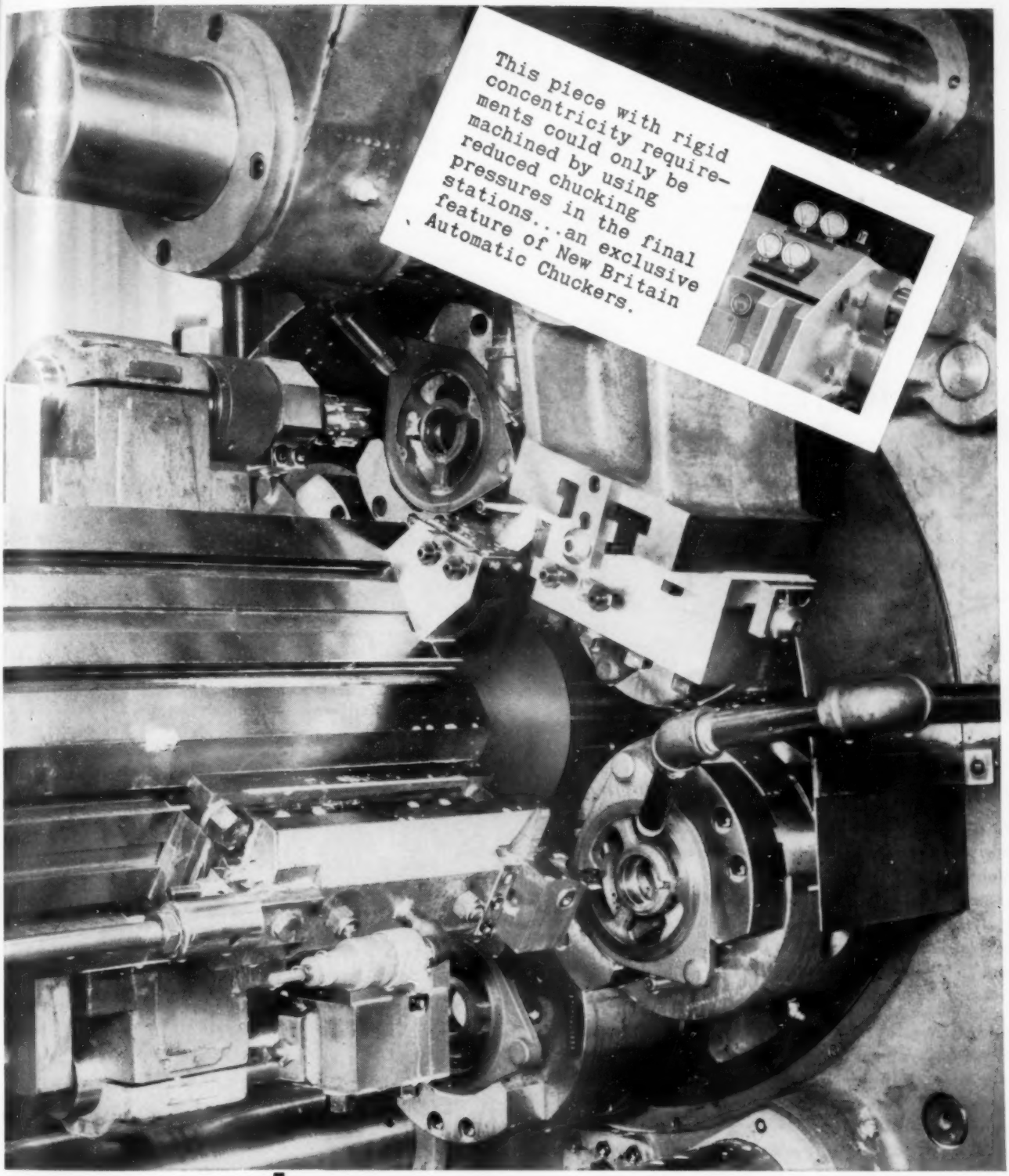

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Plain and Universal Types

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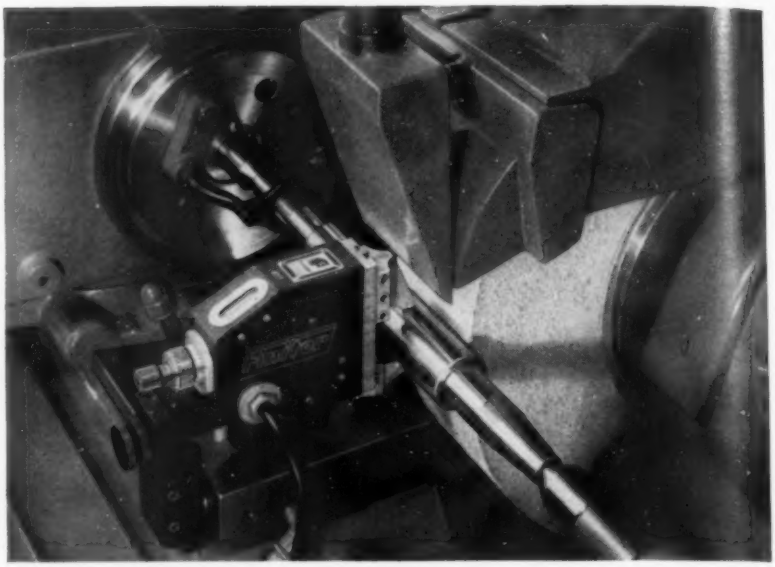
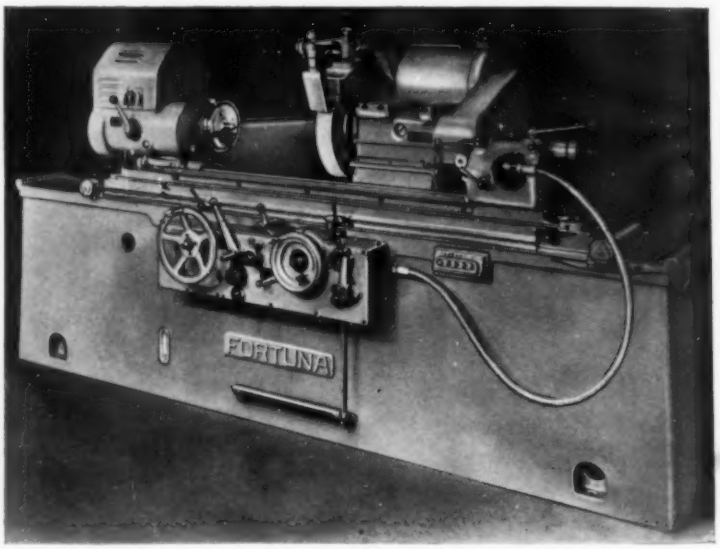


FINITOR Sizing and Measuring Attachment mounted on a Fortuna Grinder. It automatically controls operations from rough grinding to finishing, and can hold tolerances within .0001"—even on production runs.

Fortuna Grinders, for plunge cut or traverse grinding, are made in several types and sizes with maximum capacity up to 24" swing and 88" between centers . . . To increase production efficiency these hydraulically operated machines have single lever control for all operations of a pre-determined set-up . . . Numerous attachments are available to increase production and simplify grinding operations.

For instance, the FINITOR Sizing and Measuring Attachment provides automatic control of grinding operations—which means that even unskilled operators can produce accurate work at high production rates. The FINITOR consists of a gage connected to electric and hydraulic controls. When the workpiece has been ground to the correct size, determined by the gage, the controls automatically stop the machine and reset it for the next grinding operation.



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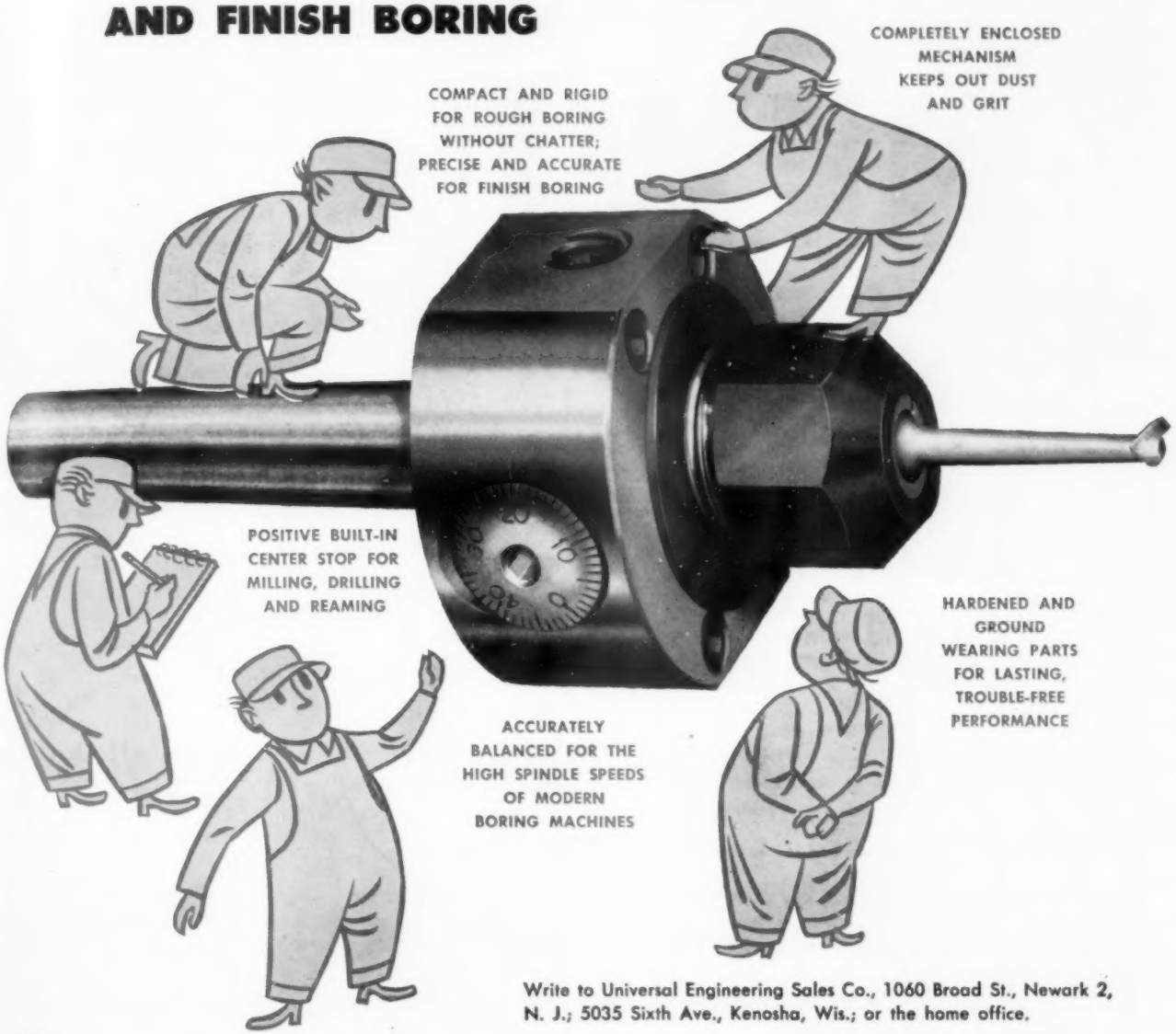

Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

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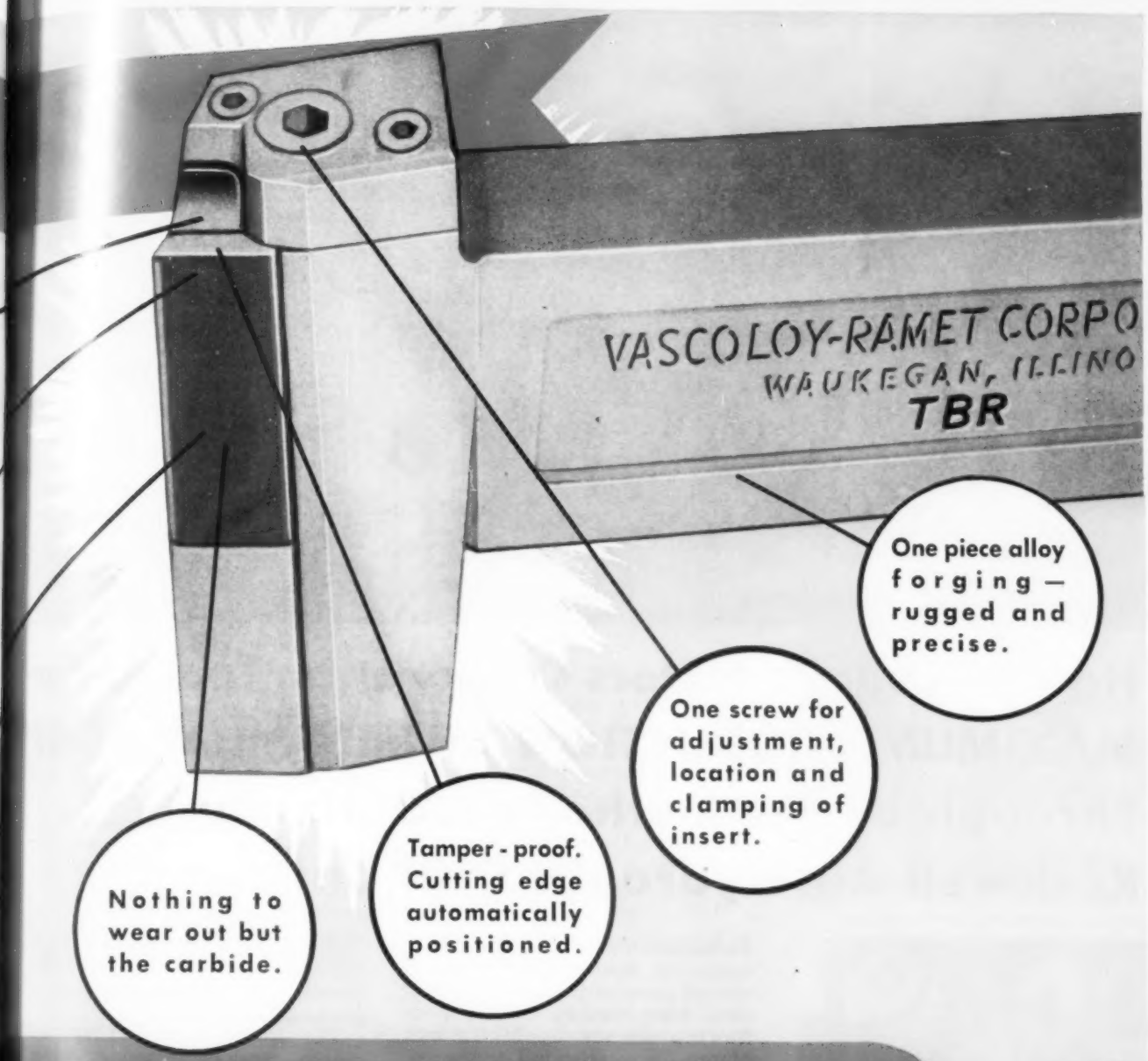

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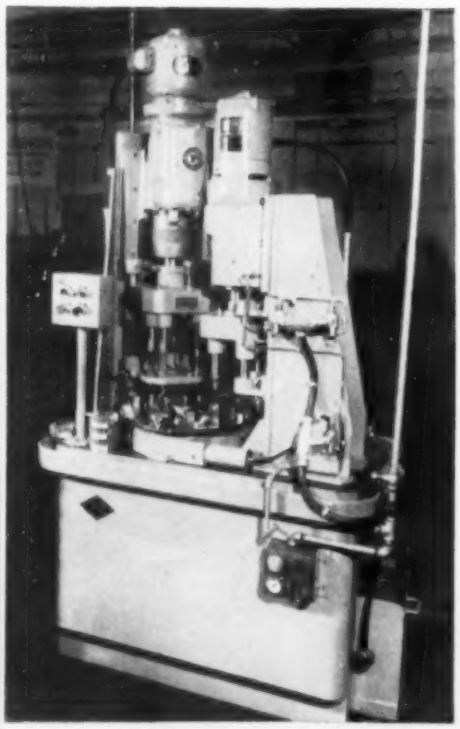
How McCulloch Motors Corporation Tooled for MAXIMUM PRODUCTION at MINIMUM COST Through Better Methods...Utilizing Rockwell Air-Hydraulic Drill Units



MOUNTED AND ELECTRICALLY INTERLOCKED to provide a one, two operation, this Rockwell Drill Unit drills, reams two holes in cooling fans (see A and B in Figure 1) for McCulloch Saw Motors.

Techniques to hold costs down while improving quality in the manufacture of complex precision products have been reduced to a smooth flowing science by McCulloch Motors Corporation in Los Angeles.

By combining the principles of Automation with imaginative production planning, McCulloch has not only enjoyed meteoric growth, but is widely regarded as one of the most efficient manufacturing facilities in the nation. Production of the famous McCulloch Chain Saw is an outstanding example of the use of better methods made possible, in part, by developments in high-speed, automatic equipment, such as Rockwell Air-Hydraulic Drill Units* for close tolerance machining.

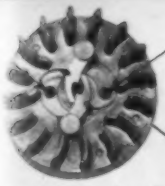
DRILL UNITS CUT COST THROUGHOUT

In the manufacture of power driven saws, cost reduction is effectively demonstrated by McCulloch's use of Rockwell Drill Units in virtually every segment of applicable tooling and machining. Drilling and boring operations on vital precision motor parts are performed automatically, with great rapidity, to tolerances of ±.0005". The low-priced Rockwell Drill Units are mounted in multiple sequence machines, specially designed to coordinate the flow of production.

The Rockwell Drill Units approach, machine to pre-set depth, then rapid retract, with non-productive time and motion reduced to a minimum of mere fractions of a second per cycle. Each machine operation is made to exacting limits, practically eliminating rejects. According to McCulloch production management, the Rockwell Drill Units provide great versatility, plus effective methods in achieving lowest possible cost-per-unit.

NEW METHOD BASIS FOR AUTOMATION

The Rockwell Air-Hydraulic Drill Unit itself is actually a new and somewhat revolutionary methods concept—the basic vehicle to *automation* in drilling, tapping, counterboring, and kindred operations. It is a completely self-contained, sealed production tool developed to provide maximum accuracy and cost efficiency in either high speed manufacturing, or slower, more specialized production. The Rockwell Drill Unit provides, for the first time, multi-



URE 1. Cooling Fan

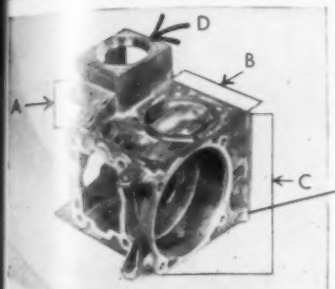
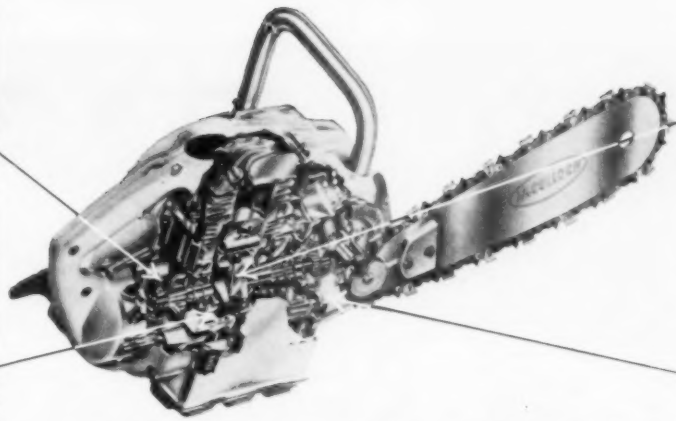


FIGURE 2. Crank Case



INSET PHOTOS indicate vital parts of the McCulloch Power Saw on which Rockwell Drill Units perform 44 machining operations. Better methods, utilizing machines like Rockwell Drill Units, enable McCulloch Motors to mass-produce precision products at competitive prices.

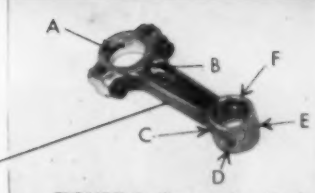


FIGURE 3. Connecting Rod

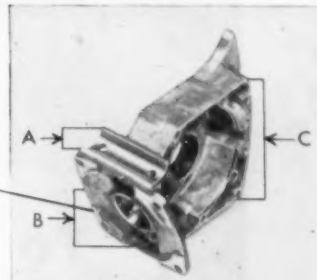


FIGURE 4. Gear Case

purpose adaptability in a compact, automatic and remotely controlled, precision power package. One operator controls all motion, and an entire size range of components can be handled without changeovers.

The plant air system provides the power for the positive hydraulically controlled motion, and three infinitely variable adjustments control length of approach, feed, and depth. No cams are used in the mechanism, and adjustments can be made while the unit is in operation. With only three basic moving parts, maintenance is negligible.

The Rockwell Drill Unit operates in any position, either singly, or in multiples, electrically interlocked with other units or mechanisms, and can be operated by unskilled personnel with minimum training.

SAVINGS PROVED IN USE

Here are a few examples of the way in which the Rockwell Drill Unit is providing manufacturers with better production at lower cost:

Radio Receptor Company saved $8,000 in first cost (the nearest machine in price to do the job cost $10,000.00), cut rejects to almost zero, while cutting cost per part by 40%.

Portable Electric Tools, Inc. report that "Rockwell Drill Units reduced production costs at least 25% on a job with tolerances of plus .0005" and minus .0001"."

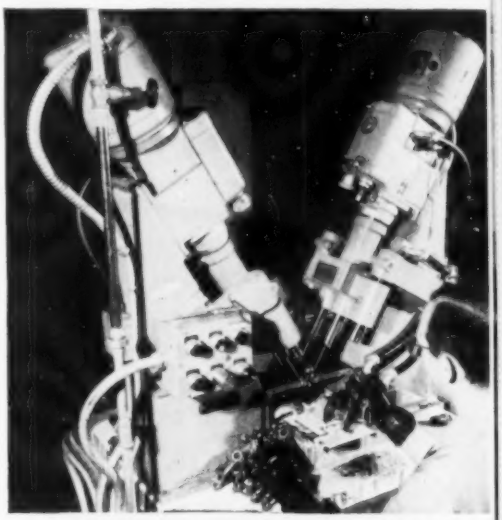
A. B. Dick Company's Rockwell Drill Units cut the time of machining a part from 25 minutes to 2 minutes.

Felt & Tarrant Manufacturing Company reduced cost of 15 operations by 10%, using Rockwell Drill Units on parts smaller than 3/16" diameter to tolerances of .0005".

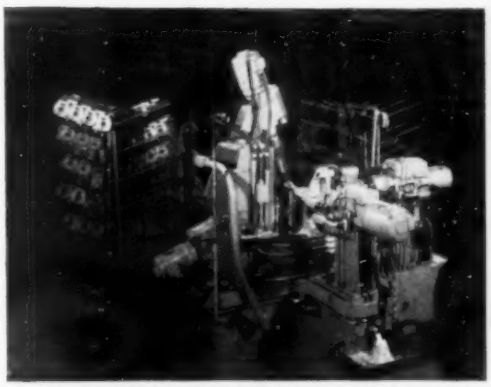
The Bossert Division of Rockwell Spring and Axle Company reduced cost of centering and chamfering differential spiders from $.0278 to $.0185 per unit with Rockwell Drill Units.

ENGINEERING AID PROVIDED

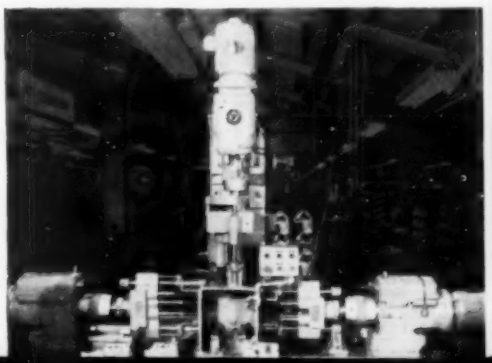
In hundreds of plants throughout the nation, the Rockwell Air-Hydraulic Drill Unit has proved that it makes possible better production at lower cost. Rockwell Drill Unit sales engineers are equipped to make demonstrations right in the plant, and to offer intelligent engineering aid in adapting the Drill Unit to production applications. Full information is obtainable by writing to: Drill Unit Division, Rockwell Manufacturing Company 620E N. Lexington Avenue, Pittsburgh 8, Pa.

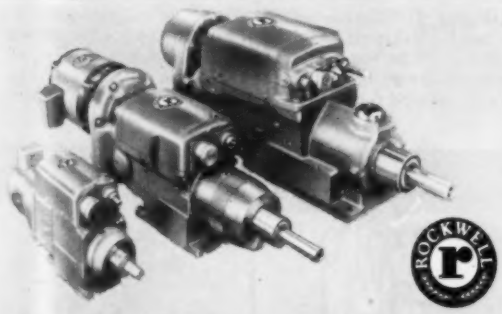


ROCKWELL DRILL UNIT SET-UPS automatically center drill and drill four holes on the piston pin end, (see C, D, E, and F in Figure 3) and two on the shaft end of forged steel connecting rods, (see A and B in Figure 3).



FOUR ROCKWELL DRILL UNITS perform 13 drilling and reaming operations on 3 facings of gear cases (see A, B, and C in Figure 4). Sealed construction permits mounting in any position.





Air-Hydraulic **DRILL UNITS**

Another Product by **Rockwell**

"Originally produced by Rockwell under the trade name "Delta."

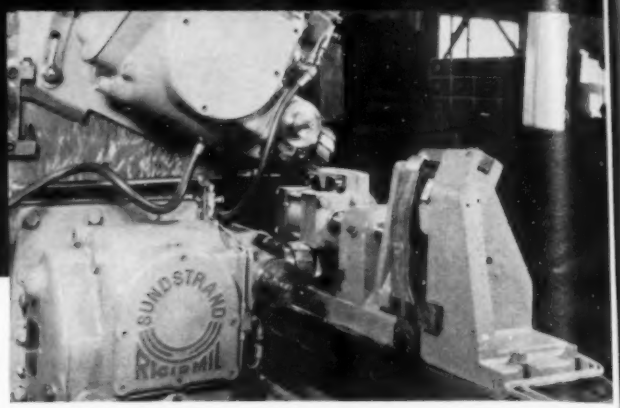
ROCKWELL DRILL UNITS are available in 3 models, with 15 drive arrangements ⅓ . . to 5 h.p.—for maximum adaptability to individual production applications.

PRODUCTION RATES of 122 per hour are provided by these multiple spindle Rockwell Drill Units on 3 facings of Chain Saw motor crankcases (see A, B, and C in Figure 2). In addition to drilling the 14 holes, the Drill Units bore, chamfer, and spot face the large bore (D at top of Fig. 2).

HERE'S WHAT CAN BE DONE WITH STANDARD RIGIDMILS...

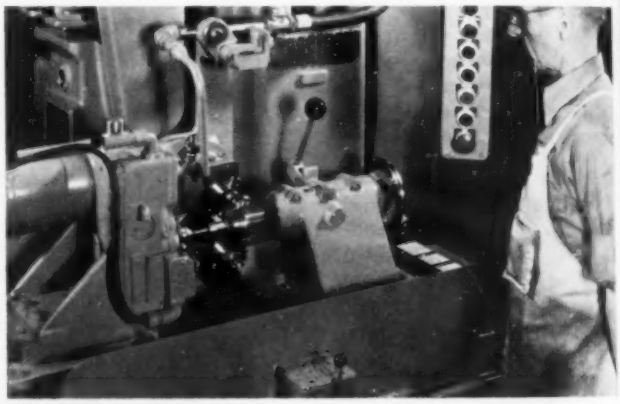
To Solve Special Milling Problems

On standard Sundstrand Rigidmils, the head is a self-contained unit which can easily be replaced with a special head. Consequently, when production or work requirements permit machining several surfaces simultaneously, the standard head can be replaced with a special head, and a *special* job done with the lowest possible capital investment. Furthermore, putting into effect product changes (a difficult problem for many production engineers) doesn't worry anybody in plants where Rigidmils are installed. As these machines can be converted so readily to meet production changes, they represent a combination of maximum production with minimum capital investment. Here are six good examples of standard Rigidmils "engineered" to a production job with "only the head as special".



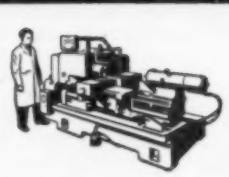
Vertical and Angular Pads Milled Simultaneously On Rigidmil With Special Head

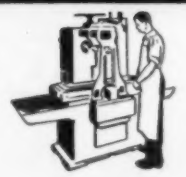
This standard Sundstrand Model 22 Rigidmil has a special two spindle head for milling two pads on steering gear housing brackets. One head is fixed horizontally and the other has 10 degrees of angular adjustment. The work holding fixture holds one piece at a time and is hydraulically operated. Two pads, one angular and one vertical are milled in one pass of the table at the rate of 100 pieces per hour.

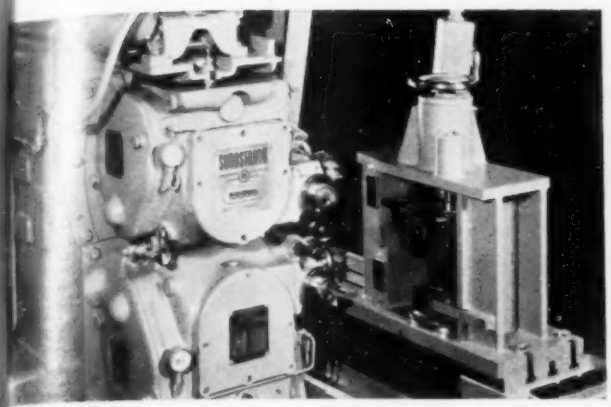


Rigidmil With Special 2-Spindle Head Mills Slots In Pump Rotors

The special 2-spindle head on this standard Rigidmil simultaneously mills 2 vertically opposed slots in pump rotors. The machine handles 3 different sizes of rotors, which are held between centers of the tailstock and special indexing fixture. In an automatic cycle the table rapid approaches, feeds past the upper and lower slotting cutters and reverses for indexing. The action is repeated 6 times to mill the 12 slots in each part.

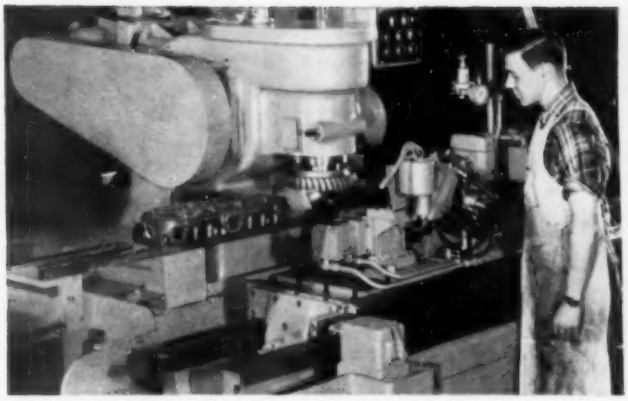






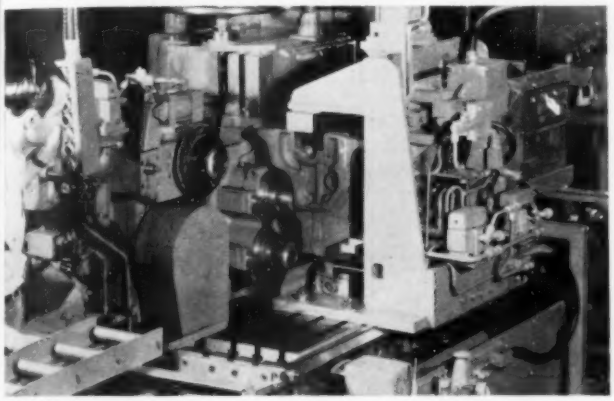
Offset Pads On Bearing Retainers Milled On Rigidmil With Twin Horizontal Spindles

This standard Sundstrand Rigidmil has been provided with two horizontal single spindle heads, one above the other. The two spindles are offset for simultaneously milling a boss and one edge of flange of bearing retainers. A simple, manually operated work holding fixture holds one piece at a time, and an automatic table cycle of rapid approach, feed and rapid return is used to machine the two pads on 60 pieces per hour.



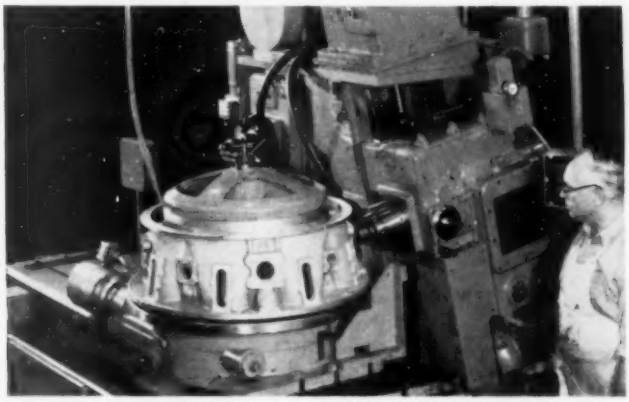
Rigidmil With Vertical and Angular Spindles Mills Combustion Face and Manifold Pad of Cylinder Head

This special head's vertical spindle mills the combustion face and its 25° angular spindle mills the manifold pad. The work is clamped in an air-operated fixture and in automatic cycle is fed at 35 inches per minute past the cutters to remove .015" of stock. At end of feed stroke the fixture automatically unclamps and a hook arrangement pulls the cylinder head out of the fixture as table rapid returns. Production is 60 per hour.



Odd Pads of Cylinder Block Milled On Rigidmil With Special 3 Spindle Head

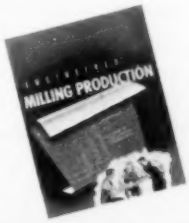
Here is a standard Rigidmil with a special horizontal three spindle head for face milling two locating bosses and two shoulder bosses on automotive cylinder blocks. The two lower spindles are fixed but upper spindle automatically retracts to clear the rear end of block. The work enters the air-operated fixture from the incoming conveyer, is automatically fed through the cut and advanced clear of the cutters to the outgoing conveyer. Production is 70 blocks per hour.



Rigidmil With One Horizontal and One Angular Head Mills 21 Pads on Compressor Frame

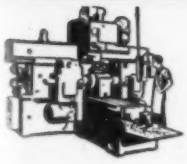
This standard Rigidmil has a single column on which a horizontal and a special angular head are mounted. The angular head mills 8 angular pads and the horizontal head mills 13 pads, all presented to the cutters by a special Sundstrand 21 station index base. In addition to the standard vertical feed attachment, the machine has automatic quill setting to control depth of cut and electronically controlled table and head feeds for infinite variation in a range from 2" to 100" per minute.

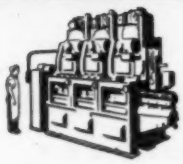
Write for more proof of the successful application of Sundstrand "Engineered" milling production. This new 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 743.



FREE DATA

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2540 Eleventh St. • Rockford, Ill., U.S.A.

Bottoms Up... Down... Sideways

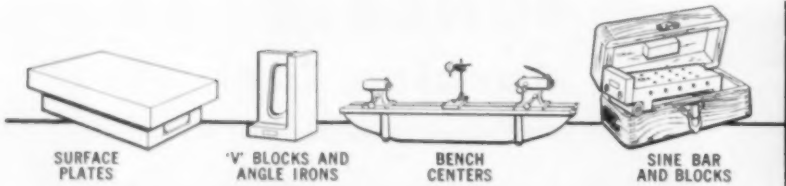
New Taft-Peirce MULTIPLEX ANGLE IRON

Cuts Your Set-Up Time

Here's another new Taft-Peirce shortcut to faster, easier setups for machining and inspection. The first real development in angle irons in several decades. ALL surfaces on a MULTIPLEX Angle Iron are scraped accurately flat . . . square within .0005″ in 6″ length . . . and parallel to opposite sides within .0005″ tolerance.

Note the inside right angular faces *meet*, unlike old style angle irons. Made of high quality cast iron, properly normalized and aged, base and angle sections are ribbed for rigidity. A valuable time-saver on boring mills, planers, and drill presses too, Multiplex angle irons frequently reduce multiple machining operations to only *one* setup.

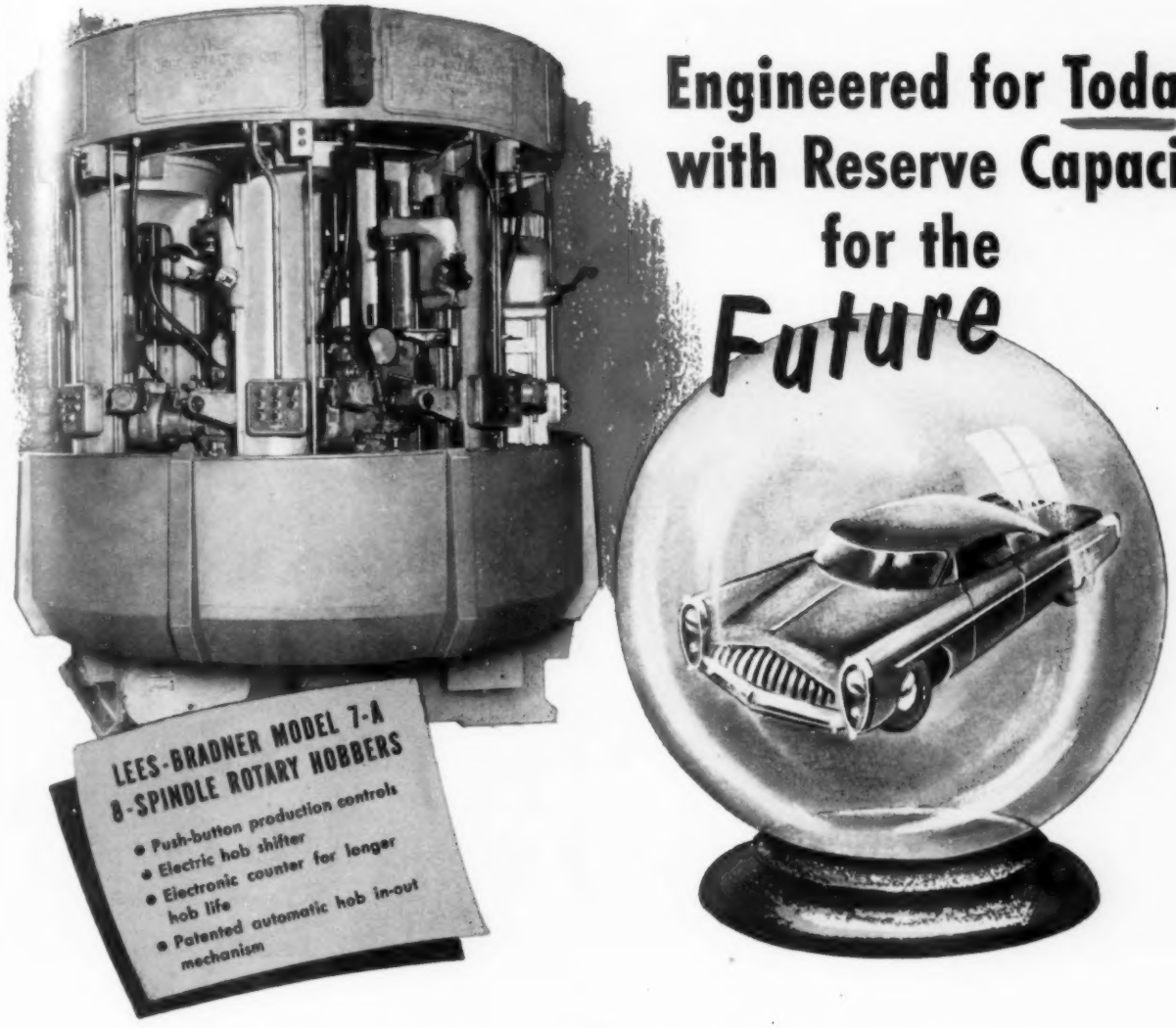
Now stocked in 12″ x 12″ x 12″ size. Plain working surface (without holes or slots) measures 9″ x 12″. Approximate weight is 95 pounds. For more information on these and hundreds of other Taft-Peirce Toolroom Specialties send for your copy of the Taft-Peirce Handbook.



T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.



Engineered for Today with Reserve Capacity for the Future

Things are moving fast these days. The car that was so spanking new and modern yesterday is "old hat" when the new models come out.

The same could be said for machine tools. That's why it's important to *look ahead* when buying machines. To ask *more* than "What can it do today?" Tomorrow comes fast and it's important that the tools you buy now have the reserve capacity for your future needs.

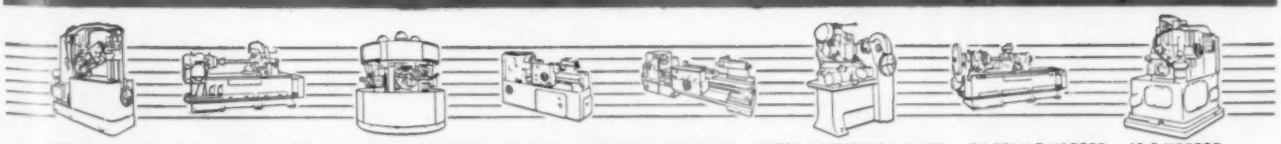
Lees-Bradner hobbing machines are *engineered* for extra capacity. They're built to run longer and at greater speeds than other machines of their type. And because they are semi-automatic the labor savings are considerable.

That's why we can say that when you buy a Lees-Bradner hobber you're buying not only for today but for tomorrow, too.

Your Lees-Bradner representative will be glad to give you the facts. Or write us direct.

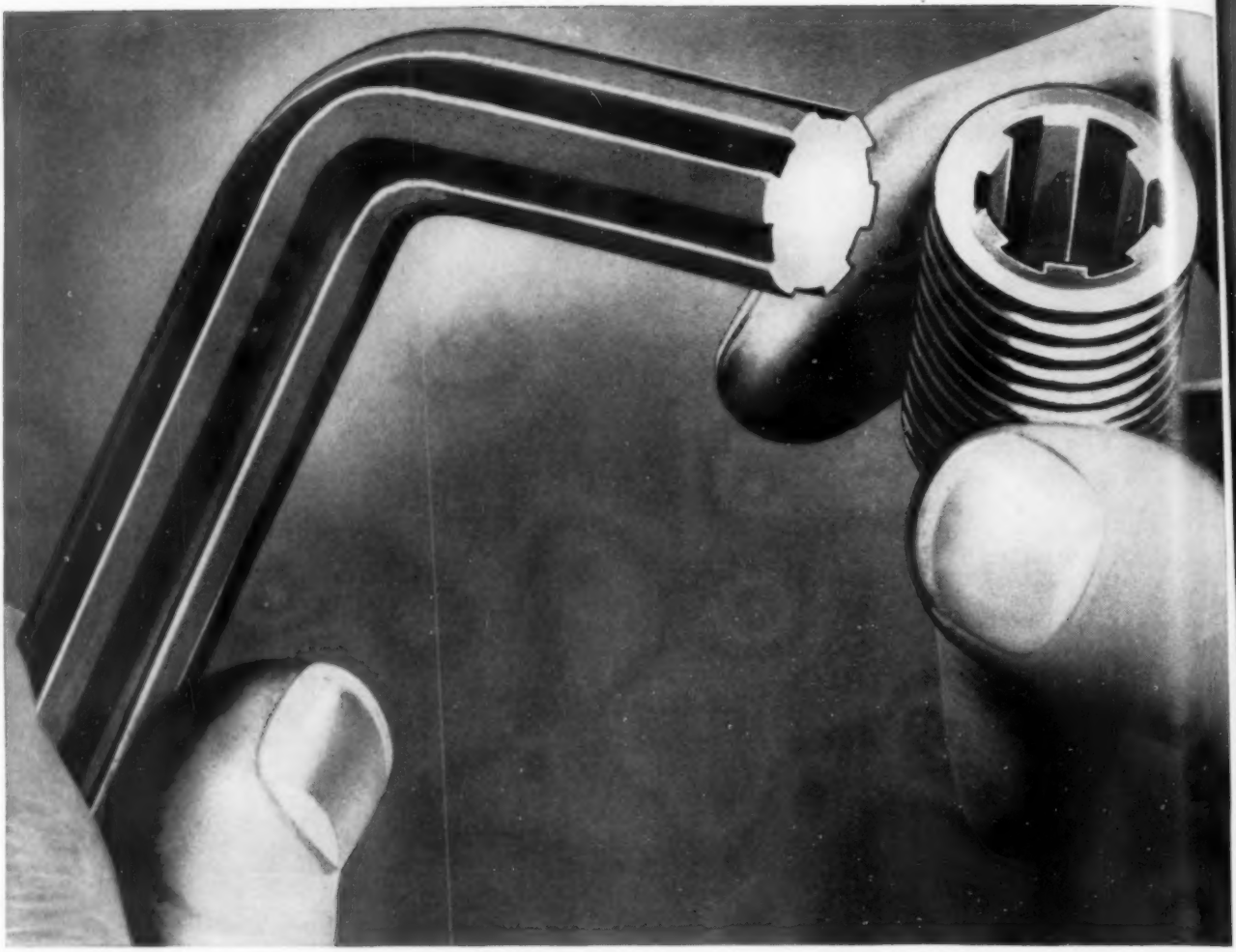
the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER



Multiple-Spline Set Screws hold tighter– because you can wrench them tighter!

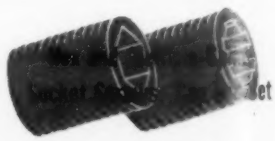
The extra holding power of Bristol's exclusive multiple-spline set screws enables these flush-fitting fasteners to be used in the newest, most compact design applications.

They withstand severe shock and vibration, permitting fewer and smaller screws to be used without sacrificing strength.

While the splining principle has long been recognized as the best means of transmitting rotary power, the materials of which they are made also contribute to the tremendous holding strength of these Bristol set screws. Standard screws are made of heat-treated alloy steel; bronze, brass, monel or other metals are available on special order.

Bristol multiple-spline set or cap screws are carefully designed to close tolerance (ASA approved) in sizes from 0 wire to ½" in diameter. Get them through your regular industrial distributor.

BRISTOL'S SOCKET SCREWS



THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

Master Machinist's DREAM COME TRUE!

First and only truly dual-purpose lathe, with features never offered together before...the Monarch 13″ model EE precision lathe

It's a toolmaker's lathe—and it sets new standards in high work output. It's a manufacturing lathe—slashing turning time with toolroom accuracy and finish. It will do any turning job within its capacity better and faster, as a look at the partial list of features will assure you. It offers flexibility unlimited with *complete* control concentrated at the apron—66 thread and feed changes—full accessory complement as regular equipment. It's built for the utmost in ruggedness, ease, accuracy and speed. Write for our Booklet #502 with the complete 13″ Model EE Lathe story.

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

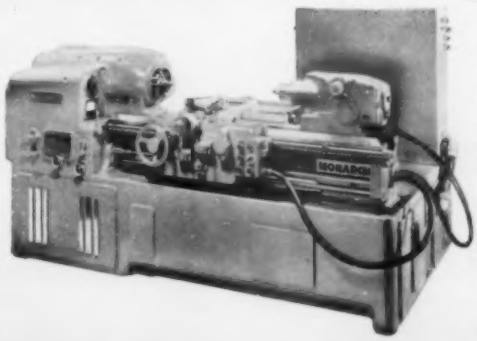
Monarch makes a 10″ Model EE, too. Turn the page for details.

You Get All This in the Monarch 13″ Model EE

1. Built-in constant surface cutting speed. Most efficient cutting speed, always—improves accuracy and finish—reduces some facing times up to 50%.

2. Infinitely variable speeds up to 2000 R.P.M. With 15 H.P. variable speed motor delivering 4 overlapping ranges, number of speeds is limitless. High speed range direct to spindle thru multiple "V" belts.

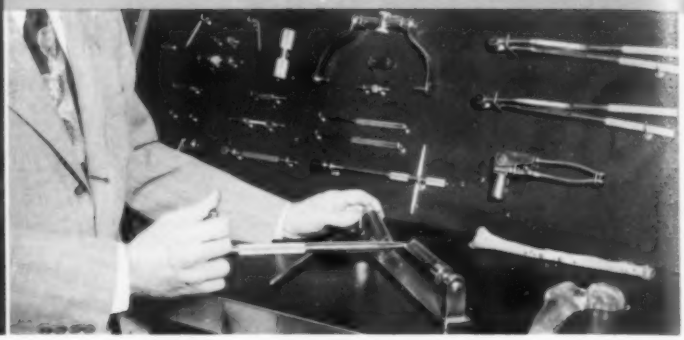
3. Electric speed change. Practically instantaneous. Accomplished from operator's normal position at apron. No calculating of lever settings by reference to an index plate is needed.



4. Four-way rapid tool traverse. Cross and longitudinal movements are provided by individual motor drive. Cuts tool adjust time 50%.

5. Unique hydraulic tailstock. Hydraulic positioning and clamping at the touch of a button. Hydraulic feed and traverse to spindle. Easiest drilling and reaming you ever saw!

Just What the Doctor Orders!



Example of sensitivity and precision without equal... from the Monarch 10″ model EE toolmaker's lathe

Doctors' orders are especially exact when it comes to these delicate but powerful, precision bone surgery instruments. To satisfy them, you need the finest machining equipment on the market.

Above you see a turning operation in the shop of Dallas R. Trinkle and Sons, famed orthopaedic engineers *and* master machinists. The part being turned by Perry Trinkle is, of course, of surgical steel. The machine is our 10″ Model EE Sensitive Precision Toolmaker's Lathe—a machine on which the Trinkles rely exclusively, because of its deft exactness in turning, boring and facing; its unlimited versatility; and because it has already given them over 40,000 hours of dependable, trouble-free service.

Perhaps your turning requirements aren't this refined. Still—wouldn't this kind of accuracy, speed and sensitivity help your production too? Let us send you our Booklet #302 giving complete information about our 10″ Model EE. Just write . . .

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Turn to preceding page for report on the companion 13″ Model EE Precision Lathe.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

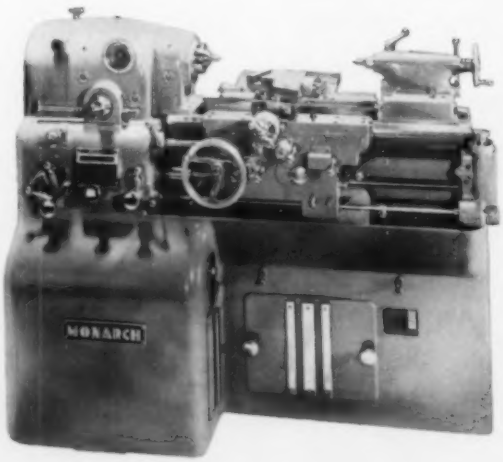
FOR A GOOD TURN FASTER—TURN TO MONARCH

Monarch 10″ Model EE features

A true high speed lathe for small work. Available with speed ranges up to 40 to 4000 R.P.M.

All electric drive direct to spindle through multiple "V" belts. No gears in headstock.

For thread chasing up to 100% faster, has exclusive combination of electric lead-screw reverse and variable reverse speed control.



The only small lathe available with anti-friction bearing taper attachment.

Easy, fatigue-free operation. Base design lets operator work close in comfort. He gets production—not backaches.

Totally enclosed, automatically lubricated end gearing and gear box.

Flame hardened and ground ways for both carriage and tailstock. Bed all in one piece—no inserts.

American Standard Camlock spindle nose—3″ Type D-1.

Over 6000 10″ Model EE machines in use today.

The 10″ Model EE—sensitive and exact as a great surgeon's hands—versatile as the venerable country doctor. Manufacturing and Toolmaker's models. With Monarch Air-Gage Tracer, they become high-output production machines noted for speed, accuracy and high finish.

Miller

FLUID PRESSURE BOOSTERS

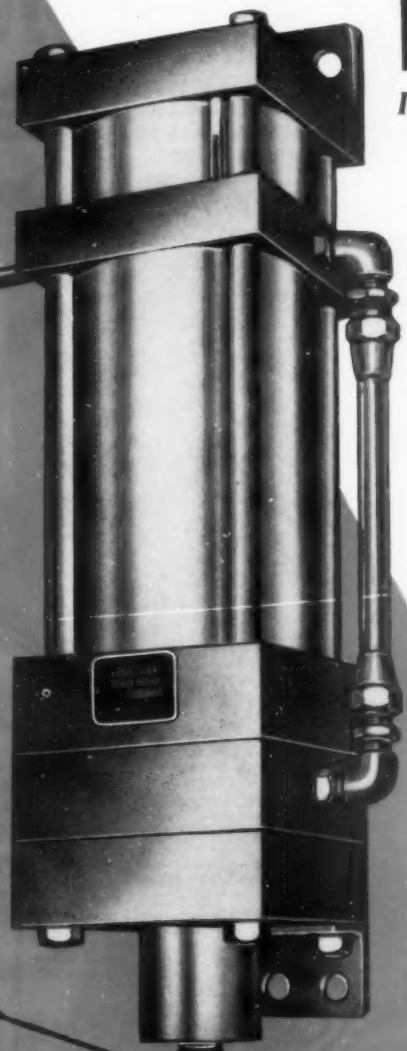
In "Custom-Built" and "Stock" Models!

BOOST 80 PSI AIR

Input Range: 40 to 3000 psi Air or Fluid

TO 2000 PSI HYDRAULIC PRESSURE

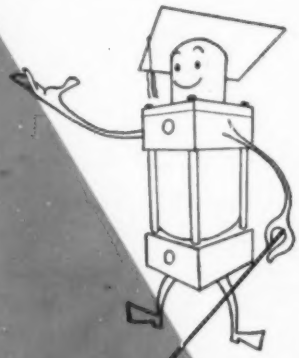
Output Range: 200 to 10,000 psi Fluid

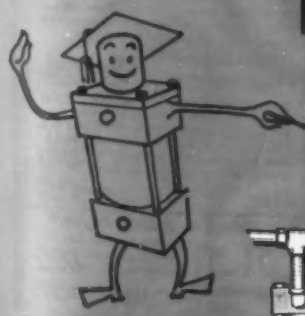


Get immediate delivery on the popular 5" bore Miller B4 (Air-Miser) Dual Pressure Booster, Model 53, with a 1" dia. hydraulic ram and "stocked" in your choice of either 6" or 12" stroke. Booster ratio is 25 to 1 (80 psi air input provides 2000 psi hydraulic output for driving one or more work cylinders simultaneously).

Separate booster air-oil tanks of 5" bore, in both 6" and 10" heights as desired, are also available for immediate delivery together with foot mounting attachments for speedy conversion of Model 53 to Model 71.

These "Stock" Boosters are identical in quality to Miller "Custom-Built" boosters which are available on normal scheduled delivery in a wide selection of models, ratios and output capacities as described and illustrated in Bulletin B-200. Write for bulletin and prices.





ESPECIALLY RECOMMENDED FOR

- **WELDING**
- **PUNCHING**
- **SHEARING**
- **CLAMPING**
- **RIVETING**
- **CRIMPING**
- **PRESSING**

and similar applications

FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST

Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

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Miller

MILLER FLUID POWER CO.

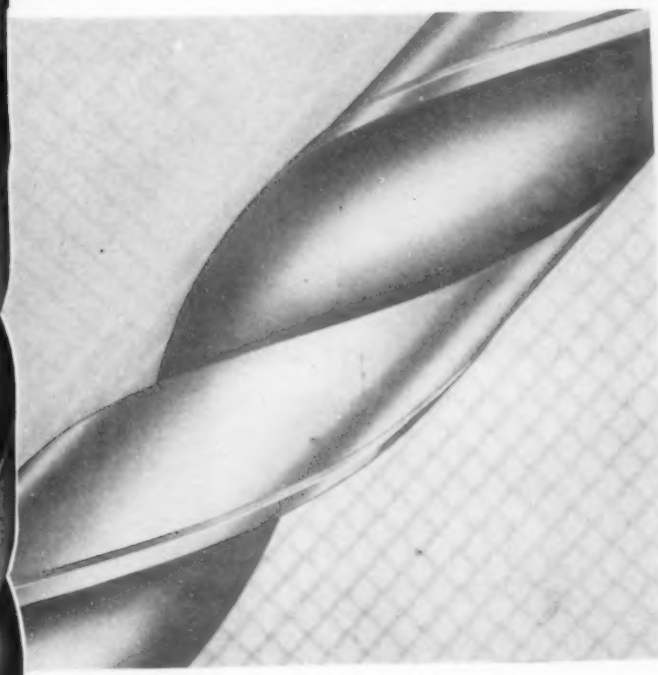
(Formerly MILLER MOTOR COMPANY)

2010 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS COUNTERBALANCE CYLINDERS

DESIGNED, ENGINEERED

Designed, engineered and produced for maximum performance — Butterfield Drills.



BUTTERFIELD

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U. S. A.

TAPS · DIES · DRILLS · REAMERS · COUNTERBORES · SCREW PLATES

FOR BETTER SERVICE
Call Your
BUTTERFIELD
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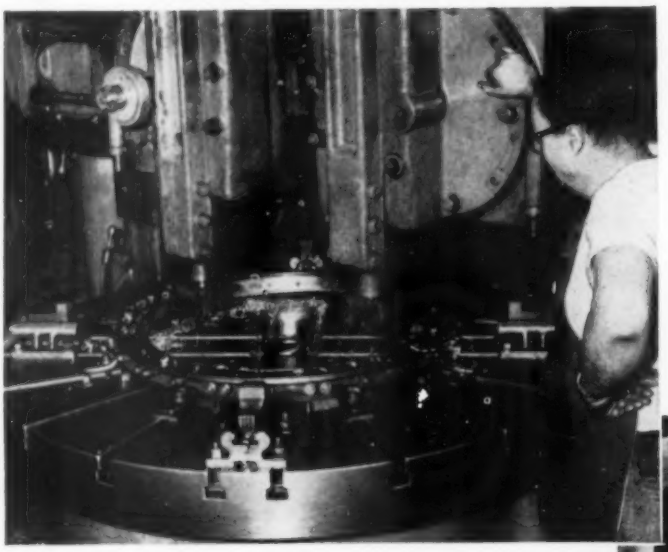
Impact Resistance Helped These Jobs PAY OFF



6 TIMES MORE RINGS PER GRIND

HAYNES STELLITE 98M2 alloy tools machine six of these stainless steel rings per grind. They remove 55 cubic inches of metal in 15 minutes while making interrupted cuts across two weld seams, 12 bolted sectors, and 36 bolt holes. Tools previously used failed before one ring was finished. The metal being machined is 321 stainless steel. The depth of cut is ¼ inch, and the speed is 160 revolutions per minute.

40 PER CENT MORE CASTINGS PER GRIND

20 cubic inches of metal per minute are removed from this 18-8 stainless steel casting by HAYNES STELLITE 98M2 alloy tools. The tools make 18 interrupted cuts per revolution as they machine the entire face of this 54 inch casting. Despite the severe operating conditions, HAYNES STELLITE tools turned out 40 per cent more castings per grind than any other tools tested. Cutting speed is 100 surface feet per minute, the depth of cut averaged ¼ in., and the feed is $\frac{1}{16}$ in. per revolution. No lubricant was used.

IMPACT RESISTANCE PLUS RED HARDNESS

The ability of HAYNES STELLITE tools to resist impact from intermittent and irregular cuts, chatter, and shock loading, is the main reason they were successful on these jobs. The tools are hard, too, and retain their hardness at red heat. This combination of properties guarantees fast metal removal; makes deep cuts at heavy feeds possible even under the toughest conditions.

A manual on cutting tool practice has been prepared to help you use HAYNES STELLITE tools to advantage. Write to any of our District Offices listed below for your free copy.

HAYNES STELLITE

Trade-Mark

Metal Cutting Tools

The original cobalt-chromium-tungsten metal-cutting tool.

"Haynes Stellite" is a registered trade-mark of Union Carbide and Carbon Corporation.

Haynes Stellite Company
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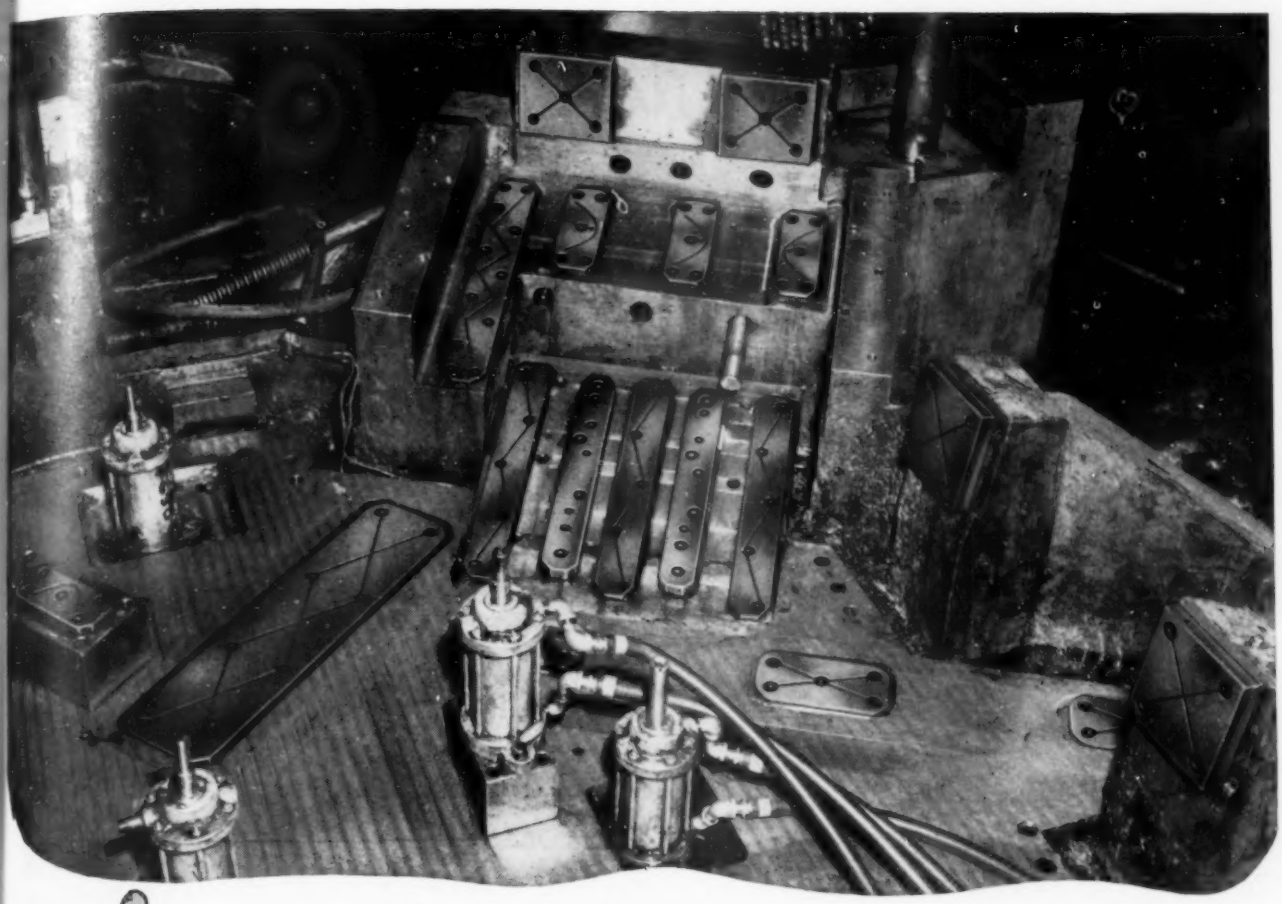


. . . long wearing, economical OK aluminum bronze wear plates

Practically every important automobile manufacturer now uses OK aluminum bronze wear plates on body dies.

By a unique cladding process, long-wearing aluminum bronze is bonded to a machinable steel base. Cost is drastically lower when compared to solid cast bronze plates. A finer quality bearing surface is obtained, resulting in longer life. When fitting is required to suit die, steel backing of plate is easily machinable, and no difficulty is encountered drilling or counter boring through bronze surface. OK aluminum bronze plates are applicable wherever a die has a sliding or cam action. A large selection of sizes of OK aluminum bronze plates is *carried in stock* . . . finished ground, flat and parallel . . . ready to ship. Simply send your drawings or sketches to our engineering department.

Manufacturers for the metalworking industry of:

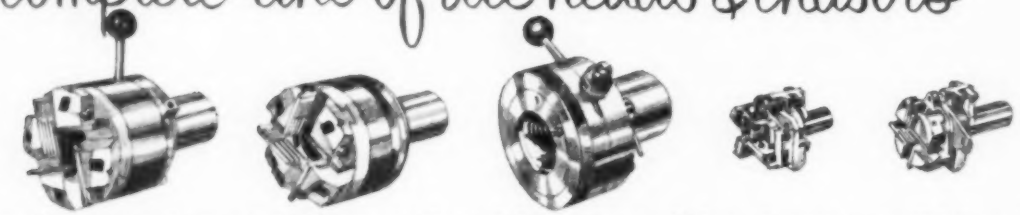
SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS ROTARY SHEAR KNIVES • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

Jones & Lamson offers...

a complete line of die heads & chasers

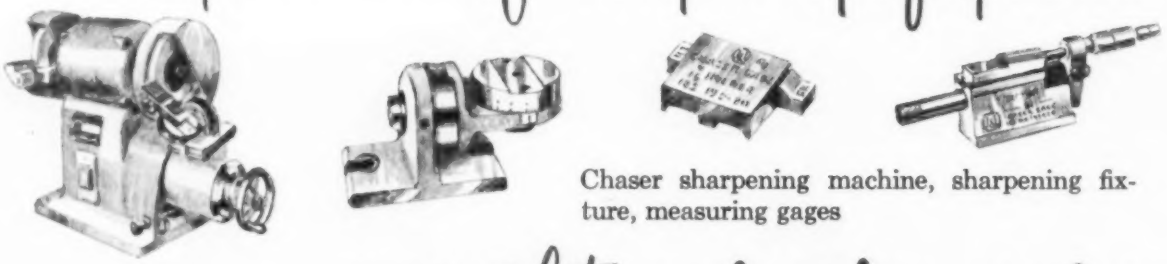


Automatic opening tangent stationary and revolving types, radial stationary type, B&S and small turret lathe types

a complete line of accessories

External and internal trip attachments, drill press adapter, floating holders

a complete line of sharpening equipment



Chaser sharpening machine, sharpening fixture, measuring gages

a complete engineering service

World's newest, most modern thread tool plant. Complete literature for all J&L thread tool products

J&L Automatic Opening Die Heads and Chasers assure: low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed. This means important savings regardless of your tolerance requirements. Write to Dept. 710 for complete information.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

All Produced on U. S. Multi-Slides®!

Secondary operations and handlings mean higher production costs. By producing parts complete in one operation you can—1. Reduce labor costs. 2. Conserve floor space by eliminating secondary operation machines. 3. Increase production. 4. Simplify inspection. 5. Improve quality.

The parts illustrated are just a few of the many different types of precision formed metal stampings that can be produced complete in the U. S. Multi-Slide. In the production of parts like these from coil stock, the U. S. Multi-Slide can effect substantial savings, because it completes a finished part at each stroke of the machine. Many different types of parts which would ordinarily require costly secondary operations can be profitably produced—uniformly and to close tolerances—and the number of inspections is also reduced.

U. S. Multi-Slides are built in four sizes. Illustrated is the No. 33, suitable for material up to 2½" in width, with feed length adjustable up to 12½". Complete specifications for the four sizes are contained in Bulletin No. 15-T. Ask for a copy.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Barber-Colman

FORMED CUTTERS

designed for peak milling efficiency, consistent form duplication, accuracy and long cutting life

Cutters specially designed and manufactured for your form milling operations give you greater cutting efficiency, the most practical means of combining cuts, and reduced milling costs. Depending upon the accuracy you require, these cutters can be furnished with either ground or unground form.

Barber-Colman uses new manufacturing controls and production equipment to give you the most accurate, long-lived formed milling cutters available.

For your special form milling requirements, call a Barber-Colman cutter specialist. He will be glad to assist you with your particular production needs.

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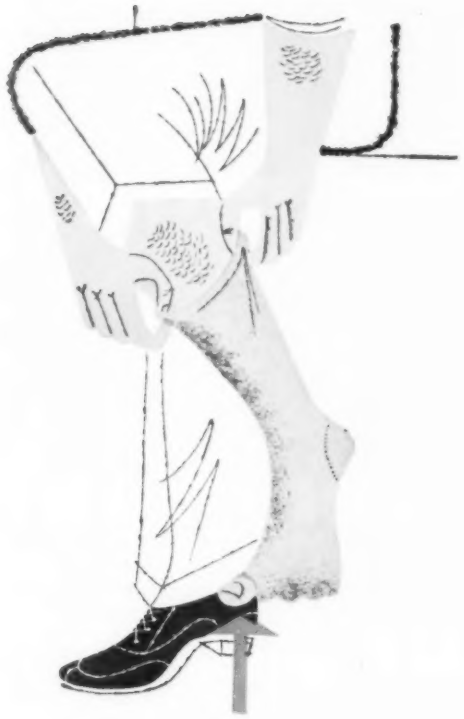
Barber-Colman Company

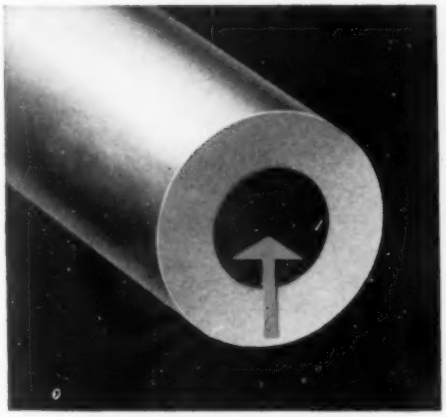
GENERAL OFFICES AND PLANT, 888 ROCK STREET, ROCKFORD, ILLINOIS

Specialists in

milling cutters, profile or formed, ground or unground thread milling, special problems



a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

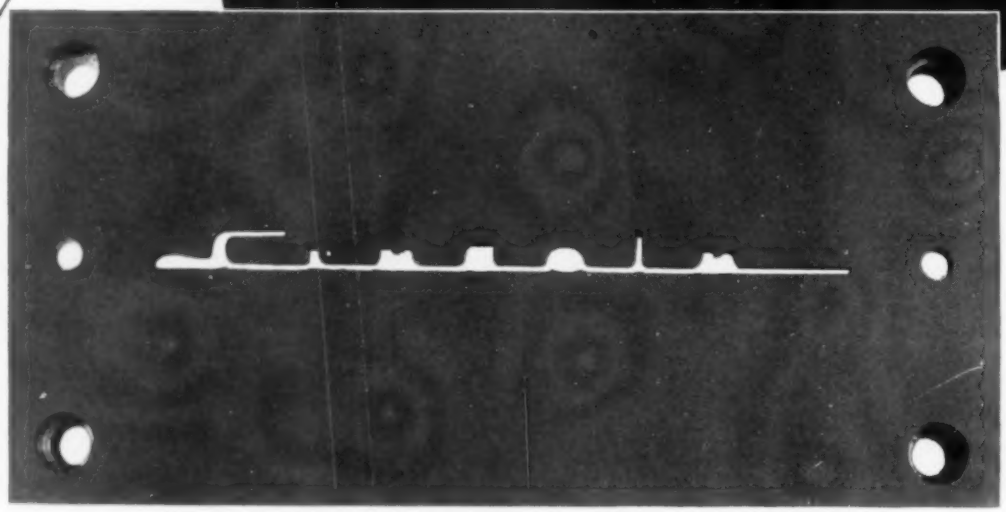
CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

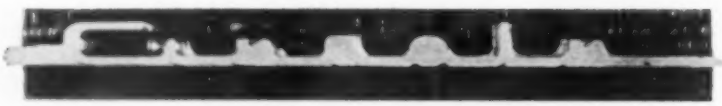
HOLLOW TOOL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

can you make this trim die in eleven hours in your plant?



FINISH TRIM DIE



ELECTRODE

man hours:

ELECTRODE MACHINING	8 hours
SETUP	2 hours
CUTTING TIME	1 hour

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SPEED KING

SOLENOID PILOT OPERATED CONTROL VALVE

by VALVAIR

DESIGNED AND BUILT TO J. I. C. STANDARDS

- **A Hefty Assist to Automation**
- **Fully Enclosed**
- **Integral Junction Box**

The Valvair line broadens again — with Speed King's exclusive features. All parts are totally enclosed. The Speed King will operate submerged in water or buried in sand. Simplicity! — only two moving parts. Molded coil — no wear or shorting out. 20,000,000-cycle life and more. Speed King is industry's most rugged and compact valve.

Other features: for pressures from 35 to 200 p.s.i. pneumatics, hydraulics, vacuum; complete line—2-way, 3-way, 4-way and 4-way-5-port (2-pressure) models; foot or sub-base (manifold) mounting; pipe sizes —¼", ⅜", ½", ¾", and 1".

Ask for Bulletin "TE-5".

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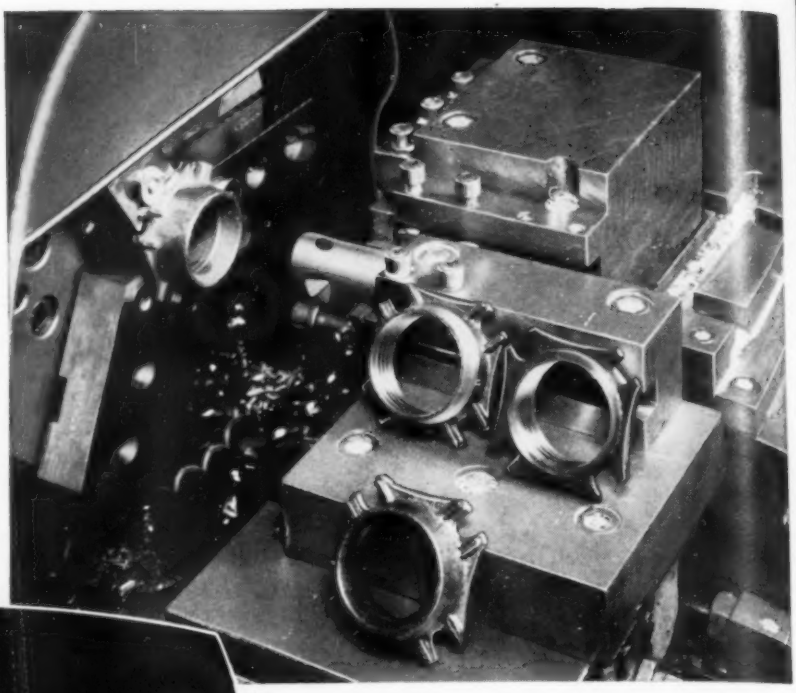
VALVAIR CORPORATION *Affiliate: Sinclair-Collins Valve Company*
979 Beardsley Ave., Akron 11, Ohio

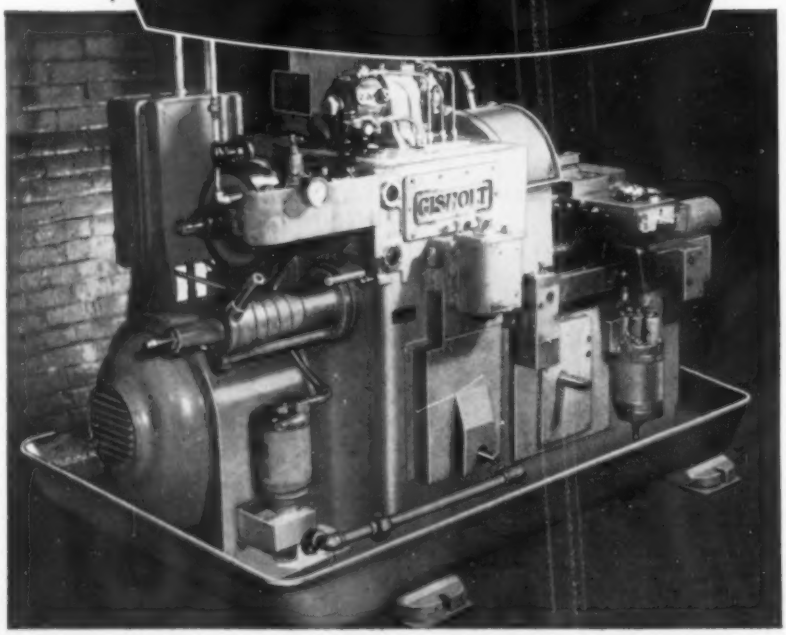
Rely Upon Valvair DIVERSATILITY

Small Job Shop Catches the BIG IDEA



cuts costs with—

GISHOLT No. 12 HYDRAULIC AUTOMATIC LATHE



No matter whether the shop is large or small . . . if there's volume, there's the opportunity to make money faster with automatic machining.

The Kilbourn Engineering Company of Milwaukee saw it—and proved it again—subcontracting these parts for electric hot water heaters with the Gisholt No. 12 Hydraulic.

Greater Production

With its fast automatic cycle and multiple cutting, the Gisholt turns out these parts at twice the rate of the previous method. A man merely loads and unloads the machine. The owner is not limited to this one job either. It is easily set up to handle a variety of work up to 12" in diameter.

Corner for Profit

Such work can be highly profitable for job shops. Especially when the whole operation can be tucked into one small corner of the shop as this one is.

Progressive thinking like this is what makes many small shops grow into big ones. Gisholt engineers can help you with all kinds of ideas for making the most of machine tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

The cheetah of East Africa . . . reputed to be the fastest animal on earth, has been clocked at sustained speeds of from 70 to 80 miles per hour.

SPEED!

Bath High Speed Steel Taps do a fast, accurate threading job! When conditions require sustained high speeds for top efficiency, they'll stand up . . . hole after hole — after hole.

The Bath process assures cutting teeth which are not adversely affected by extreme temperatures generated in high speed production tapping. In many cases, this permits the tap to be run at increased speeds.

Actually, each tapping job has an optimum speed at which the tap should be run for greatest overall economy. This optimum speed is dependent on conditions in your plant. The most important conditions are:

- the type of material to be threaded
- the type of lubrication to be used
- the type of equipment available

Check these conditions now! Pass the information on to the Bath engineering staff — and they'll recommend the optimum speeds for your production line.

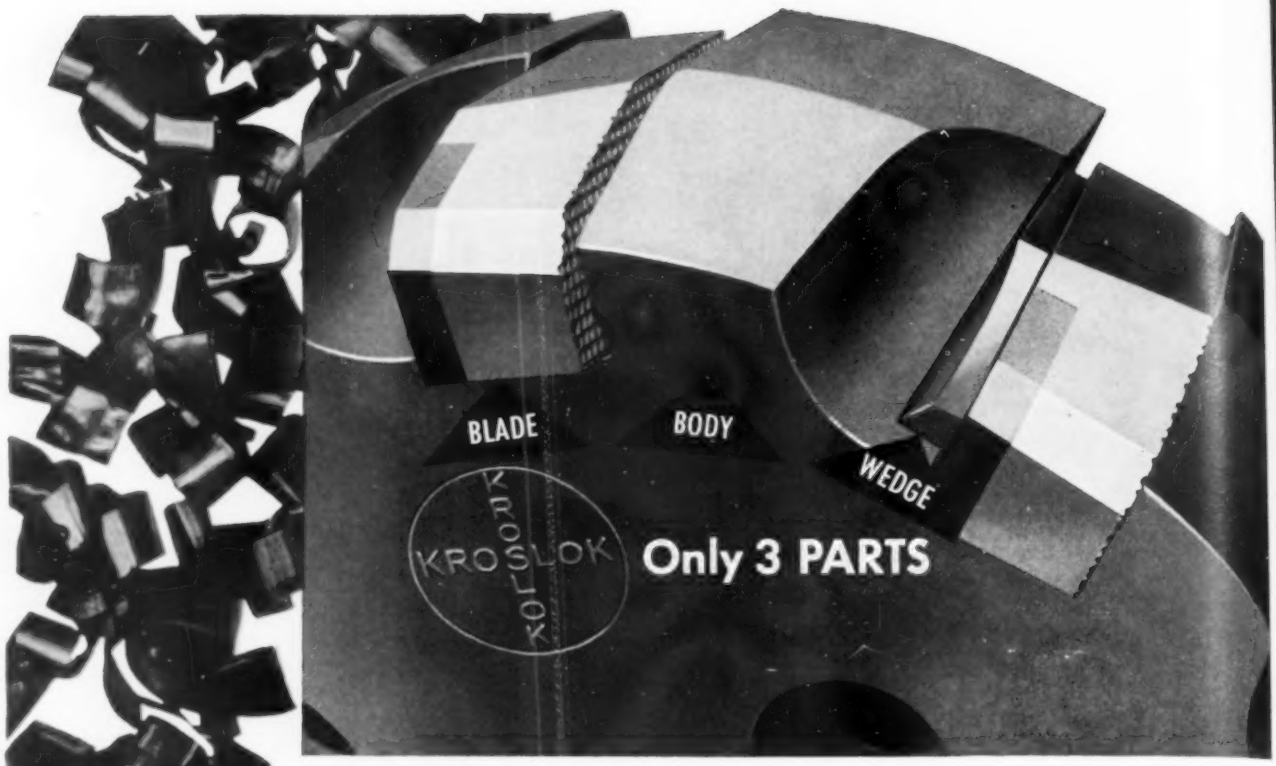
Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

28 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS



You're "in the Chips"

WITH THE MOTCH & MERRYWEATHER KROSLOK FACE MILLING CUTTER AND SHELL END MILL

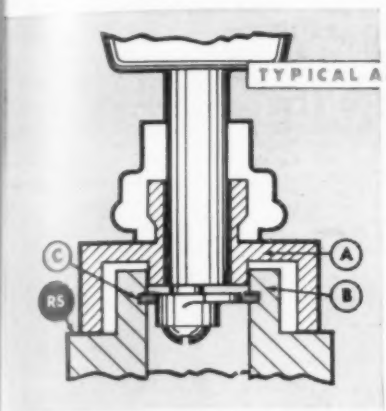
A real *blue chip* investment—KROSLOK. Be sure of positive blade holding which is obtained by immovable wedges and cross serrations mating between body and blade. Extra rugged construction! Reach new production highs by long, uninterrupted service. Make milling more profitable through higher speeds and heavier feeds. *Only three members!* General purpose and heavy duty bodies, each for ferrous and non-ferrous applications; special KROSLOKS to order.

THE MOTCH & MERRYWEATHER MACHINERY CO.

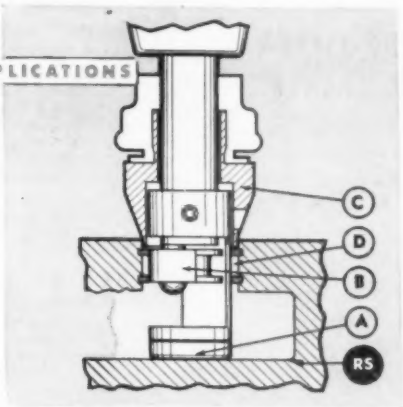
Cutting Tool Manufacturing Division
Cleveland 17, Ohio

Waldes Truarc Grooving Tool Out-Performs Conventional Recessing Tools

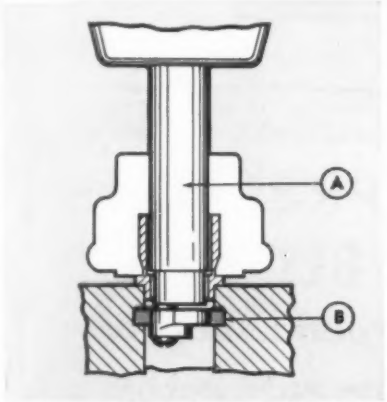
SAVES TIME! CUTS COSTS! NEEDS NO SKILLED LABOR!



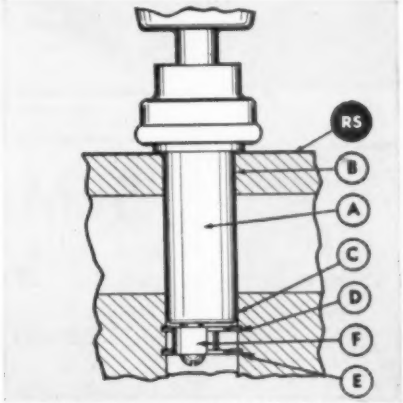
Clearing Obstructions or Protrusions — Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.



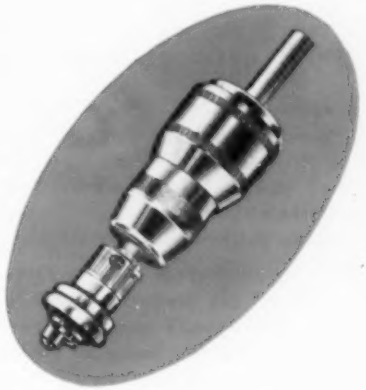
Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.



Small Diameter Bore — Need for Wide Groove – Great versatility of tools allows A-2 Tool to accept *stepped down spindle* and *cutter-shaft* assembly A. Provides cutting capacity in a bore normally within the range of smaller A-1 Tool. Illustrated, larger tool capacity necessary to cut groove diameter B exceeding normal capacity of standard A-1 Tool.



Extending Reach of Tool – Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.



AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.000 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEM TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

WRITE NOW FOR 20 PAGE TECHNICAL MANUAL CONTAINING FULL ENGINEERING DATA

WALDES

TRUARC

Reg. U. S. Pat. Off.

GROOVING TOOL

MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

WALDES KOHINOOR, INC., 47-16 Austel Pl., L.I.C.1, N.Y. Waldes Truarc Grooving Tool mfd. under U.S. Pat. 2,411,426

TE056

Waldes Kohinoor, Inc., 47-16 Austel Place
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Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool.

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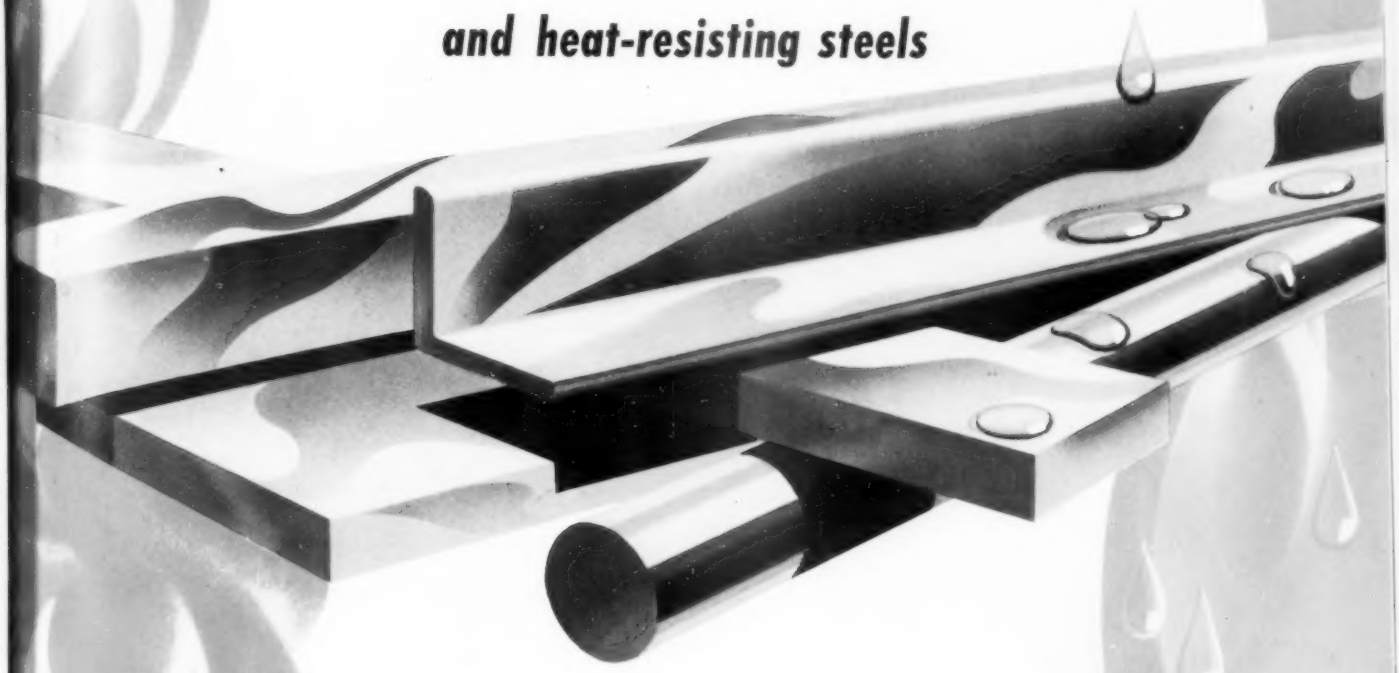

Jessop lays no claim to being the only good source of fine stainless steels. *There are a number of very reputable concerns producing products of excellent quality.* But we believe we possess a combination of virtues which make it highly worthwhile to specify Jessop when ordering stainless bars, sheets, plates or *rolled angles* —a recent addition to our line.

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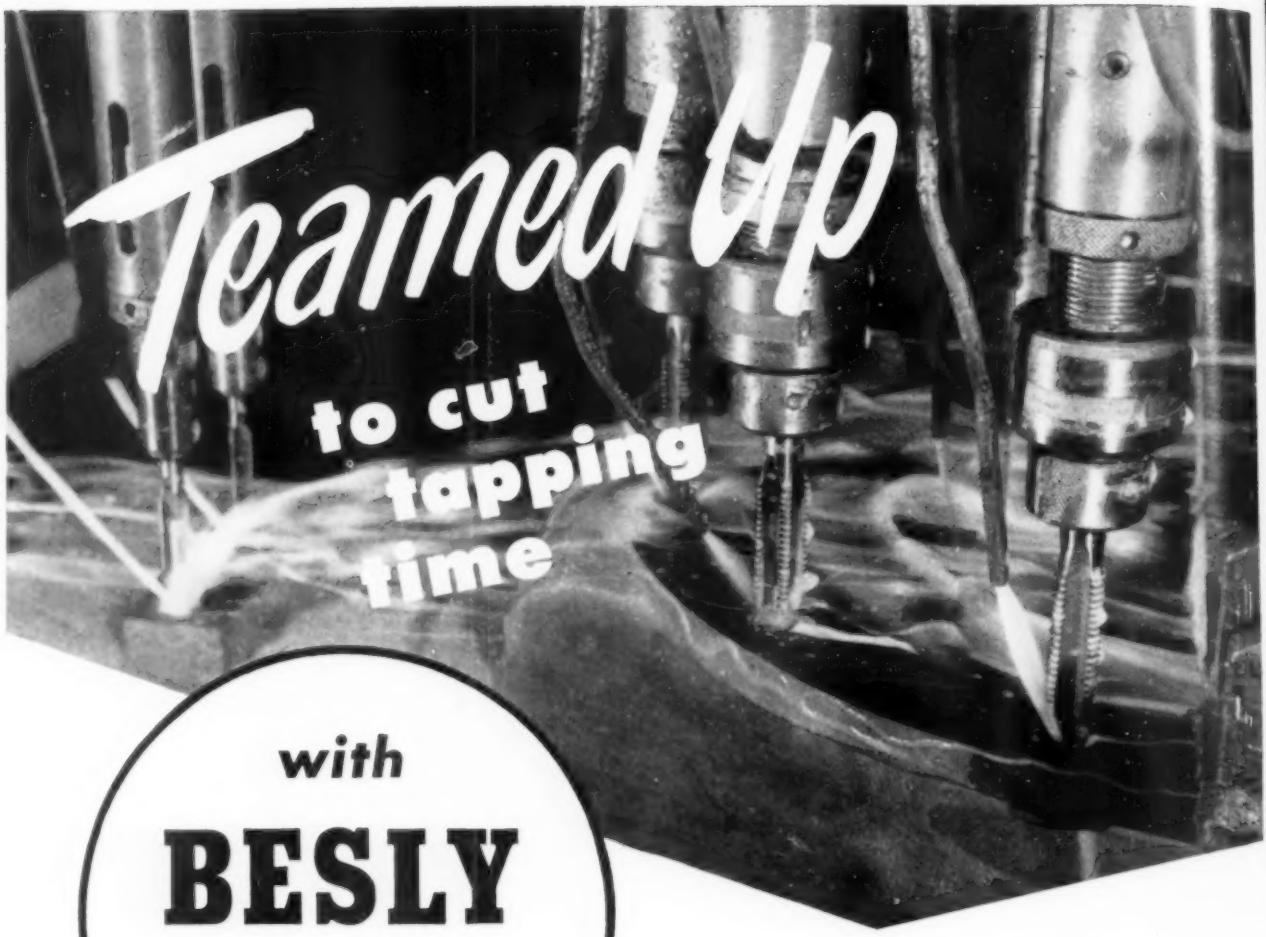
STEEL COMPANY · WASHINGTON, PENNSYLVANIA



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BESLY TAPS

AT CATERPILLAR TRACTOR CO. ... Besly Taps are used for precision, multiple-tapping operations. For example, on the D8 Tractor cylinder block, a Besly set-up taps 15 holes simultaneously in the fly wheel end.

BESLY TAPS, teamed up with the experience of a BESLY Field Engineer, can give *you* better threads, too ... with high production and long tap life. Let our engineers prove with a no-cost trial on your toughest job that BESLY gives you more tapped holes ... better tapped holes per tap dollar. Ask your distributor for proof now.

TAP TIPS

This handy HANDBOOK FOR TAP USERS informs you on up-to-date tapping methods and tap selection. *Write for your FREE COPY.*

BESLY

BESLY-WELLES CORPORATION

Established as Charles H. Besly and Company in 1875
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BESLY Drills, Reamers and End Mills . . . High Speed Cutting Tools in all types and sizes.

Put the Bite on Simonds!

...to cut your costs with the right type saw!

✱ INSERTED TOOTH SAW

For heavy production cutting of steel, brass, copper and aluminum. Alternating square and beveled teeth "tri-vide" chips for easy cutting and clearance. Maximum saw clearance gives cooler, freer cutting . . . permits extremely high rate of feed. High Speed Steel Teeth can be easily replaced singly or in complete sets, in your own plant.

✱ SEGMENTAL SAW

For especially smooth cuts on production work. Extra-service High Speed Steel toothed segments are securely held in a tough alloy plate by a tongue and groove design, have quick clearance for faster, freer cutting. Teeth are alternately square and beveled for easy cutting and clearance of "tri-vided" chips. Can be sharpened on any automatic grinder.

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For general shop cut-off jobs . . . for use on smaller automatic cut-off machines, and for cutting jobs where narrow kerf is important. Clearance ground and furnished in High Speed, Si-Maloy (Pat.), or Semi-High Speed Steel. Simonds own steel, plus accurate heat treating and grinding give these saws longer life, more dependable performance.

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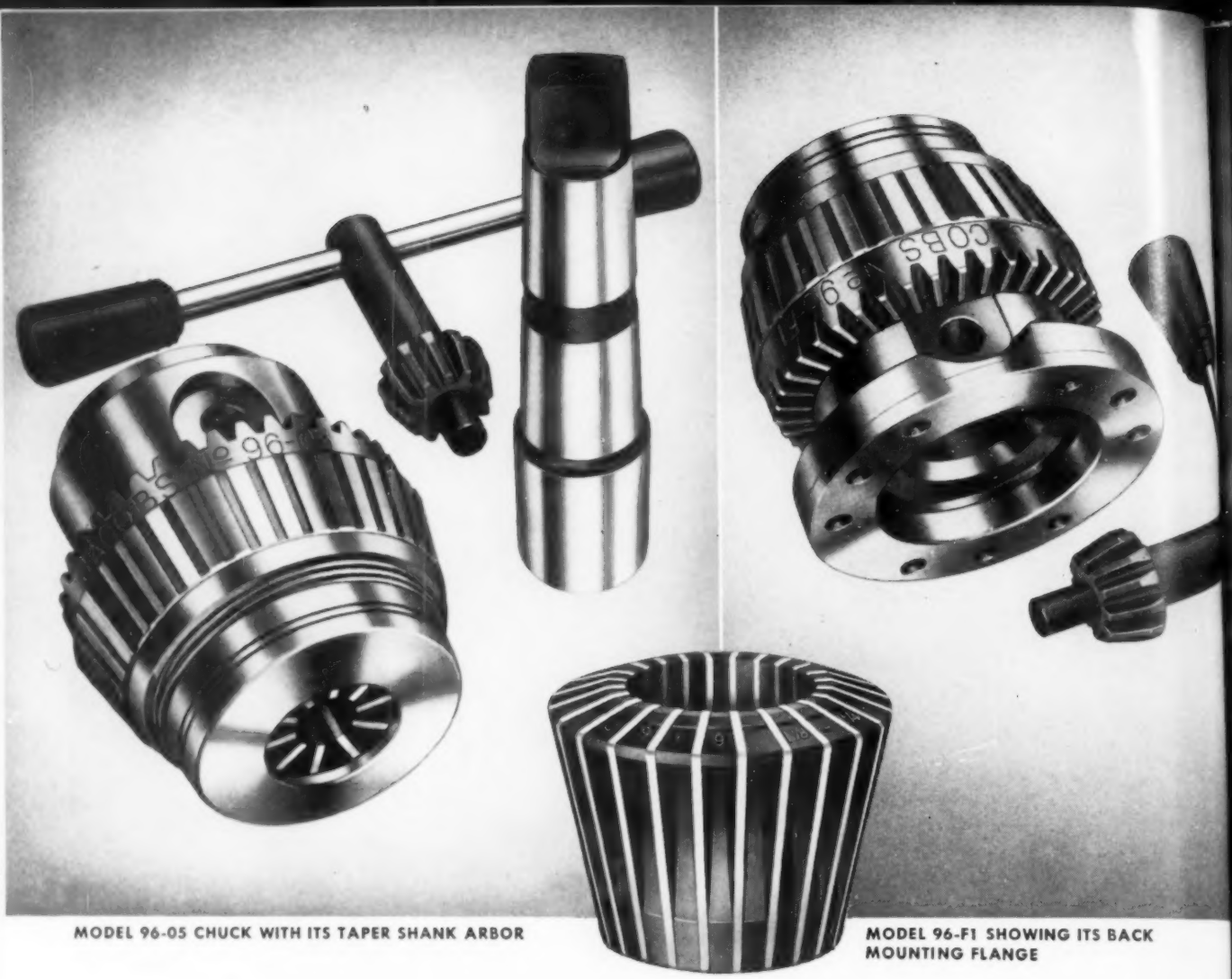


MODEL 96-05 CHUCK WITH ITS TAPER SHANK ARBOR

MODEL 96-F1 SHOWING ITS BACK MOUNTING FLANGE

NOW! New Jacobs Model 96 Rubber-Flex Collet Chuck

brings famous grip to whole new group of applications

Grinders! Milling machines! Jig borers! Jig grinders! Lathes! Various types of special machinery where precise compact collet closure is vital!

ALL get the benefit of the famous Jacobs Rubber-Flex Collet grip in the new Jacobs Model 96 Collet Chuck.

The long, steel jaws of this collet — locked together with oil-resistant synthetic rubber — provide an absolutely parallel grip over the entire bearing surface.

What's more, each collet has a full ⅛" range so that the standard set of eleven Rubber-Flex Collets cover the gripping range of eighty-eight split steel collets! A geared key tightening device and self-tightening toggle action of the collet jaws give the chuck gripping power far beyond that obtained with split steel collets. Chucks any diameter bar between 1/16" and 1⅜".

For work holding: Model 96 Collet Chuck permits precision chucking of bright finished bars, with close or wide tolerance diameters, resilient or compressible materials, tubing and brittle materials such as ceramics or glass.

For tool holding: Model 96 Collet Chuck can be used for drilling and reaming on jig borers and other high precision machines, holding proving bars and indicators. Extreme accuracy and wide capacity range make it ideal for tool and cutter grinding on cylindrical and cutter grinders.

TWO MODELS: Model 96-05, $135.00; Model 96-F1, $150.00. Rubber-Flex Collets, $12.00 each.

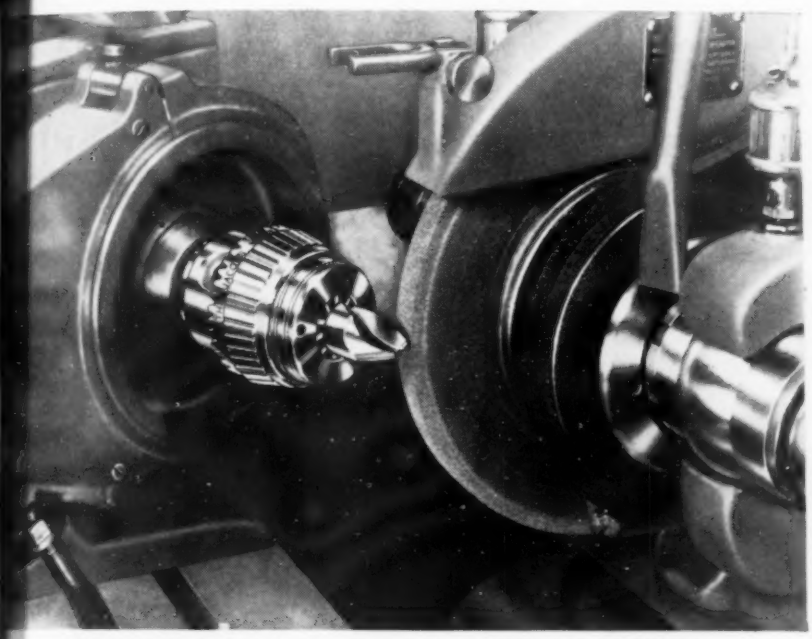
For further details, ask your Industrial Supply Distributor for Catalog 54-CC. The Jacobs Manufacturing Company, West Hartford 10, Conn.

Jacobs RUBBER-FLEX COLLETS

PRECISION REAMING ON JIG BORER with Model 96-05.

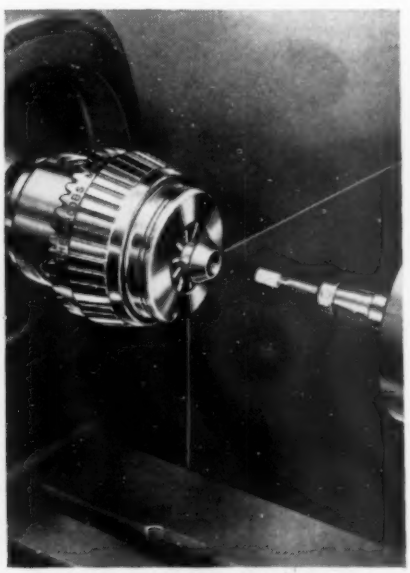
NEW JACOBS MODEL 96-F1 COLLET CHUCK on magnetic chuck holds work for surface grinder.

CHUCKING WORK ON VERTICAL MILLING MACHINE with Model 96-F1.



MODEL 96-05 ADAPTED TO HEADSTOCK OF CYLINDRICAL GRINDER.

NEW CHUCK Model 96-F1 here holds work on jig grinder.



PRECISION BUSHING GRINDING with Model 96-05.

Jarvis TORQOMATICS

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

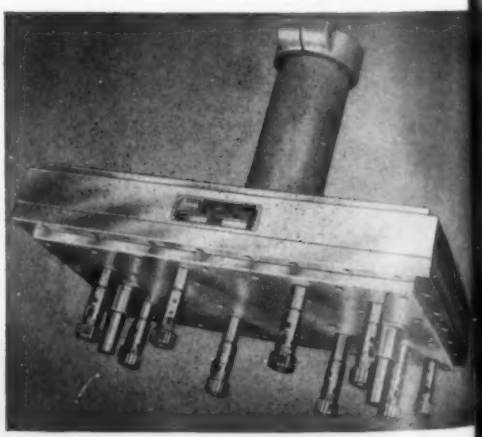
can do your tapping jobs better!

A complete range of Jarvis Torqomatics and Multi-Tapping and Drilling Heads — available to fit any type drill press or tapping machine.

You'll like their trouble-free performance — their ability to produce quality threads — their increase in tapped holes per hour, the savings in taps — and their ease of operation!

We invite your inquiries about these highly efficient Jarvis machines that have outmoded all other slow, expensive and highly perishable machines of the past.

Jarvis Torqomatics are priced low enough to make it economically possible to replace your old tapping devices and attachments.



A Jarvis representative will be glad to consult with you — no obligation.

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THE CHARLES L. JARVIS CO.

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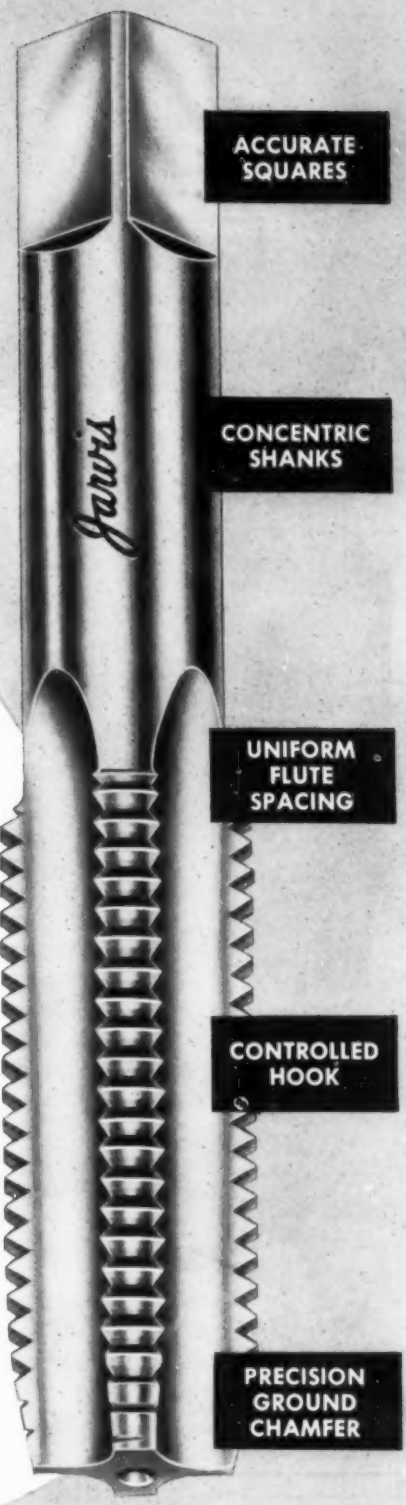
Jarvis TAPS

AN INDUSTRIAL TAP FOR INDUSTRIAL USERS



have "Custom Made" Cutting Edges at NO EXTRA CHARGE

"Custom Made" means just that! Accurate indexing and precision machine grinding of flute and spiral points on Jarvis Taps produce a tool in which ALL the cutting edges do their share of the work. Our highly accurate fluting process makes it possible for us to control for your PARTICULAR NEEDS the amount of hook ground in the flutes. Specify Jarvis, and you'll always have "Custom Made" Taps designed to do a specific job superbly well.

Send for complete New 56 page Tap Catalog and Manual.

Jarvis Manufacturers of . . TAPS

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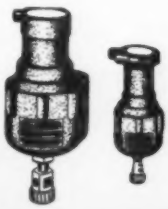
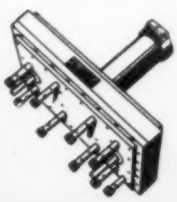


MULTI-TAPPING AND DRILLING



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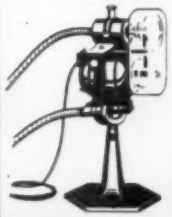
FLEXIBLE SHAFT MACHINES



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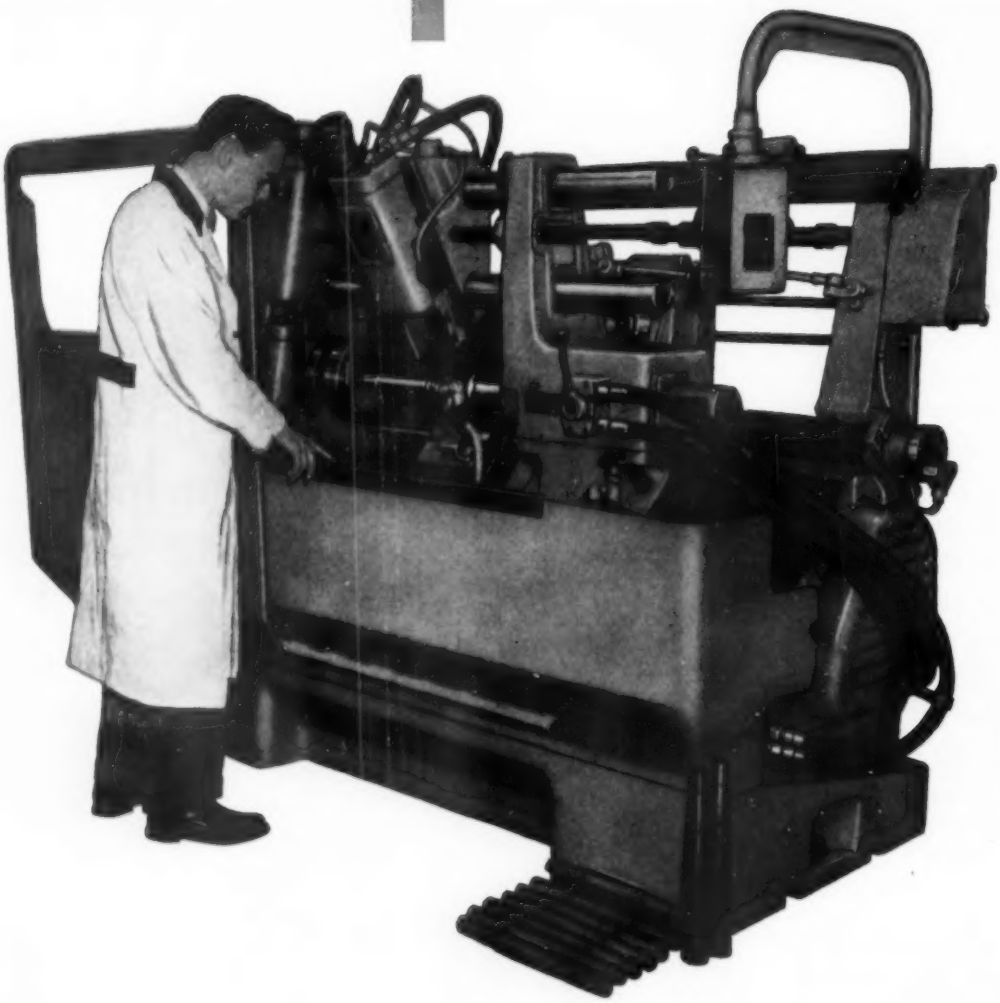
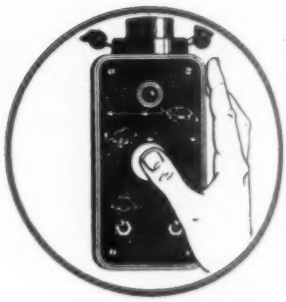
high speed HYDRAULIC COPYING LATHE



The machine that amazed visitors at the A.S.T.E. Exposition



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YOU'RE LOSING MONEY EVERY DAY on all the parts you turn with your present equipment because they would cost less on the H.E.B. Pilot. In today's competitive market you cannot *afford* to use yesterday's methods and machines.

The Pilot copyturns faster and with less tooling and labor; produces better finish and accuracy, considerably reducing grinding costs. Spindle speeds to 3,000 RPM; motors to 60 HP. Completely built in Lansing, Mich. by Industrial Metal Products Corp.

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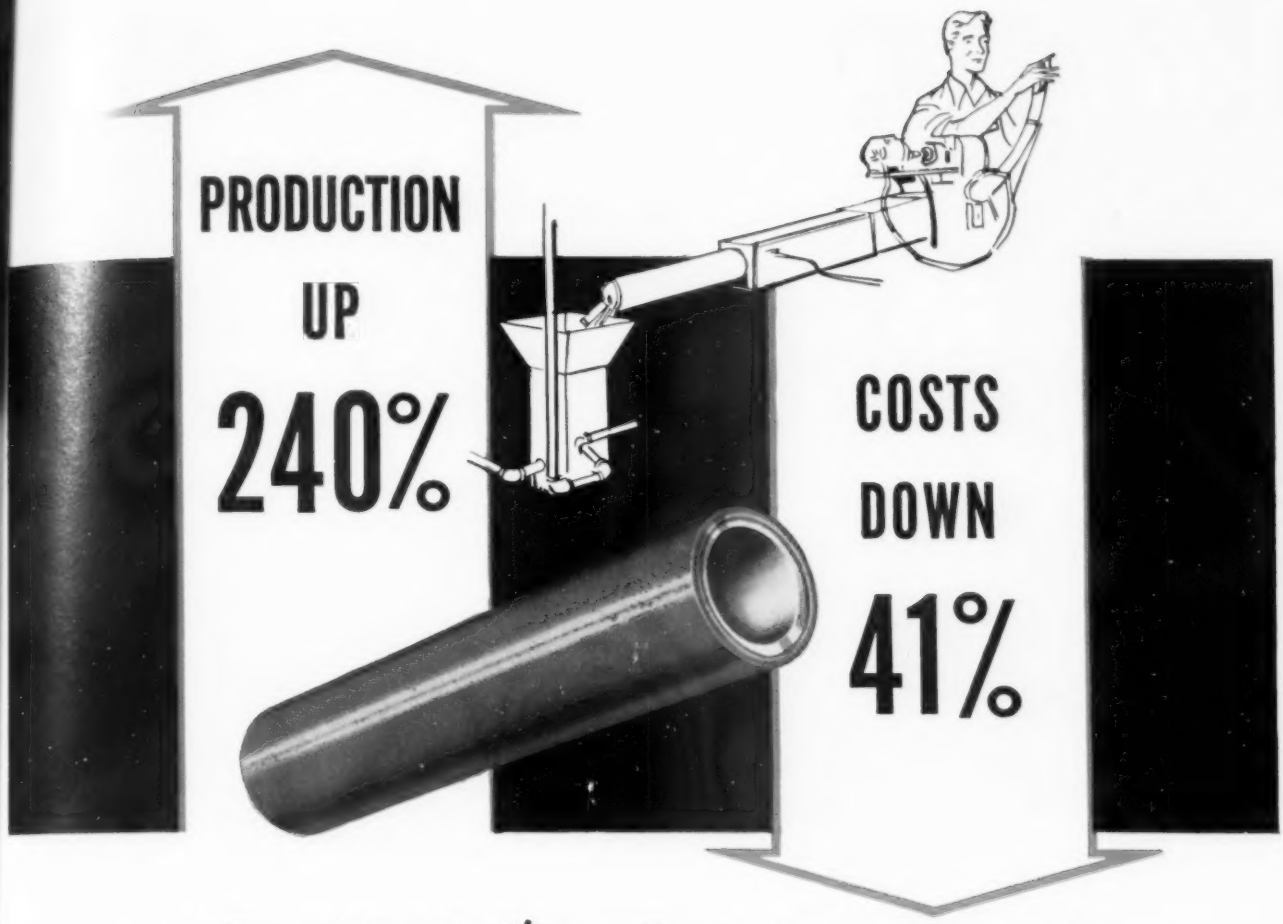

with TOCCO* Induction Heating

Whether you're interested in upping production or downing costs—or both—it pays to investigate TOCCO Induction Heating if you heat-treat, anneal, braze, solder, forge or melt ferrous or non-ferrous metal parts.

PRODUCTION UP—When Thompson Products Ltd., St. Catharines, Ontario switched from conventional methods to TOCCO Induction Hardening of their automotive wrist pins, production rose from 500 to 1200 per hour.

COSTS DOWN—While production jumped, costs fell from $5.46 per hundred parts to $3.23—a savings of more than 2c per pin or $26.76 per hour on the hardening operation alone.

OTHER ADVANTAGES—Additional savings result from elimination of hauling wrist pins to and from the heat-treat department. Cool, clean TOCCO fits right in the production line, next to related operations—takes only ¼ the space of the pusher-type furnace previously used.

In Canada or the United States TOCCO engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

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Dept. G-5, Cleveland 1, Ohio

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Peck drilling four deep holes in a magnesium casting

THE NEW SERIES 92A KELLER "AIRFEEDRILL"

—locks to any jig or fixture, and drills accurately. Stationary mounting brackets available

—operates automatically through the complete drilling cycle—advances, drills, retracts, shuts off—at a single pressure of the control valve

—handles peck drilling and skip drilling

—gives complete control over motor speed, drilling speed, torque, rate of advance, and depth of hole

It has these operating features:

SENSING TYPE RAPID ADVANCE brings the drill point quickly to the work, then drops instantly to the drilling rate.

TORQUE CONTROL causes automatic retraction as often as necessary to clear chips during peck drilling. It also protects drills and indicates when they need sharpening.

FEED CONTROL permits adjustment to varying drilling conditions, as well as the material being drilled.

VARIABLE SPEED MOTOR controlled by throttle valve . . . shuts off automatically at end of drilling cycle.

Lightweight and compact—ideal for use in portable or stationary applications

These and other features mean that you can tool up for a few hundred dollars . . . instead of thousands. Send for Catalog Section 92 which fully describes and illustrates this remarkable new tool.

KELLER "Airfeedrill"

SERIES 92A

KELLER TOOL COMPANY, 1311 Fulton St., Grand Haven, Mich.

LARGEST SELECTION OF SWISS HIGH-PRECISION MACHINE TOOLS IN THE UNITED STATES

Carl Hirschmann Company, Inc., stocks spare parts and accessories for all its lines and makes them readily available from all Hirschmann Branches. It backs these lines here with skilled technicians, factory services, and American guarantees comparable to those obtained on domestic tools.

A typical SWISS high-precision machine tool sold and serviced by HIRSCHMANN. Hauser Type 5 Jig Borer. The ultimate in precision and quality.

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Backing-off Machines, Automatic . . . Borers, Jig . . . Burnishing Machines . . . Cam-making Equipment . . . Carbide Grinding and Lapping Machines . . . Checking Instruments, Optical . . . Chucks, Keyless Drill . . . Die Sinkers . . . Drilling Machines . . . Form Cutter Milling Machines, Automatic . . . Gear Hobbing Machines . . . Grinders, Jig . . . Grinders, Twist Drill . . . Grinding Machines, Automatic Cutter . . . Grinding Machines, Carbide . . . Grinding Machines, Horizontal Rotary Surface . . . Grinding Machines, Surface . . . Grinding Machines, Relieving Tool . . . Grinding Machines, Universal Cylindrical . . . Grinding Machines, Universal Tool . . . Lathes, Rapid Copying . . . Lathes, Repetition . . . Lathes, Toolmakers' . . . Lathes, Turret . . . Measuring Instruments, Micrometer . . . Measuring Instruments, Optical . . . Milling Machines, Horizontal . . . Milling Machines, Vertical, Pantograph . . . Milling Machines, Form Cutter, Automatic . . . Polishing Machines . . . Micrometers . . . Microscopes . . . Pinion Cutting Machine, Automatic . . . Presses, Bench . . . Presses, Heavy Duty . . . Presses, Horizontal, Rapid . . . Presses, Precision Blanking . . . Presses, Shaving . . . Projectors, Profile . . . Screw Machines, Automatic . . . Screw Machines, Swiss Automatic . . . Screw Machines, Woodscrew . . . Tables, Rotary, Rotary Tilting . . . Tapping Machines, Lead Screw . . . Tapping Machines, Double Friction Clutch . . . Thread Rolling Machines, Automatic . . . Turning Machines, Semi-Automatic . . . Watch Manufacturing Machines, Special Automatic . . . Wheel, Pinion & Segment Cutting Machines, Automatic.

Largest Selection of SWISS Precision Machine Tools in U.S.

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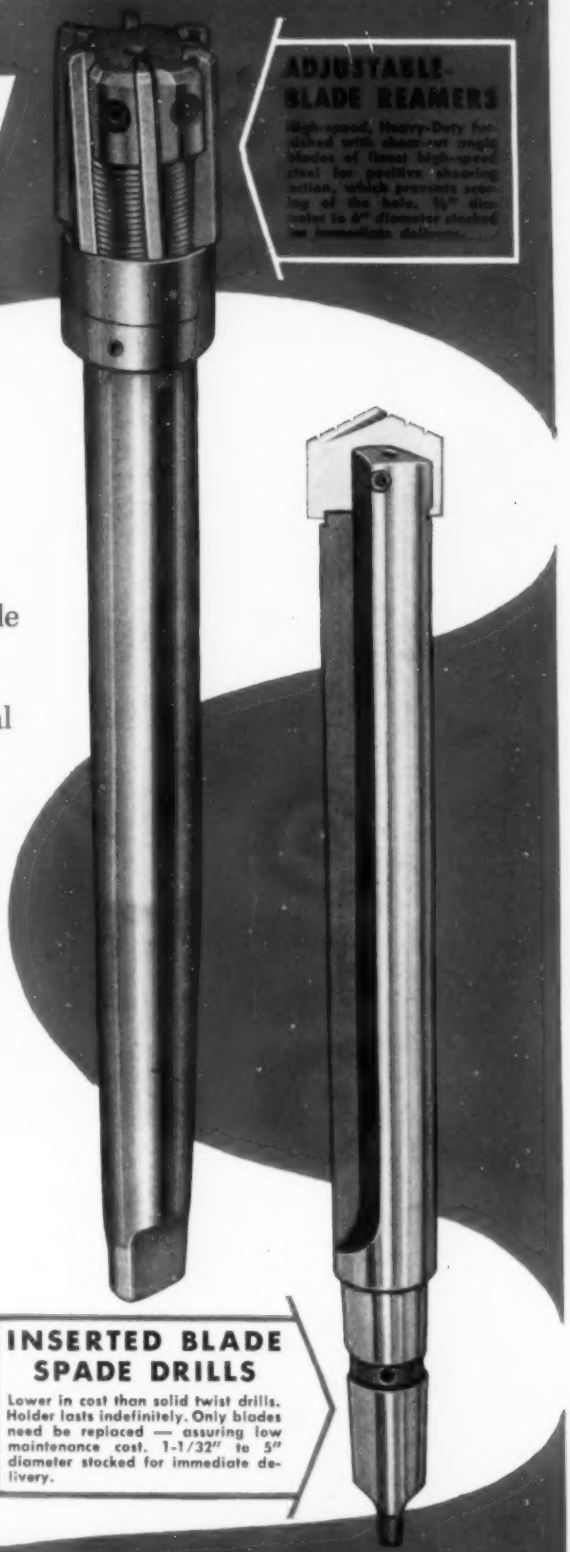
REPRESENTATIVES IN PRINCIPAL CITIES

"Standards" by WAUKESHA

ADJUSTABLE-BLADE REAMERS

High-speed, Heavy-Duty fluted with shear-cut angle blades of finest high-speed steel for positive shearing action, which prevents scoring of the hole. ½" diameter to 6" diameter stocked for immediate delivery.



. . . meet most of your Cutting Tool Needs . . . most of the time!

The use of Waukesha Standard Inserted Blade Reamers, Spade Drills and Counterbores eliminates substantial investments in "special tooling". The adjustability, adaptability and ready availability of standard Waukesha Cutting Tools save costly engineering time, eliminate down time for new tooling. You can make savings in your cutting tool costs by specifying Standard WAUKESHA Cutting Tools.

INSERTED BLADE SPADE DRILLS

Lower in cost than solid twist drills. Holder lasts indefinitely. Only blades need be replaced — assuring low maintenance cost. 1-1/32" to 5" diameter stocked for immediate delivery.

consult WAUKESHA

. . . for competent cutting tool counsel. Waukesha sales representatives and engineers are qualified to work with your own staff in adapting standard Waukesha Tools to your needs . . . or in the development of special cutting tools.

WAUKESHA TOOL CO. WAUKESHA WISCONSIN

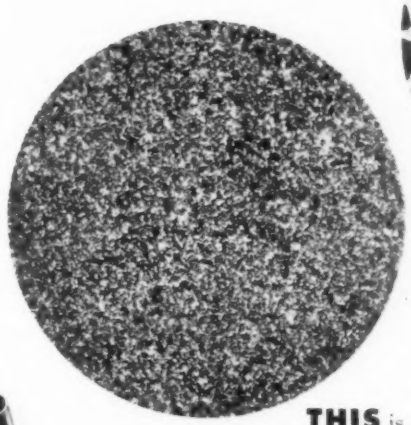
Manufacturers of Carbide and High Speed: INSERTED BLADE REAMERS • SPADE DRILLS • TAP DRIVERS • BORING BARS • INSERTED BLADE COUNTERBORES • FLOATING TOOL HOLDERS • SPECIAL TOOLS

A7735-1P

You don't need 3-D glasses

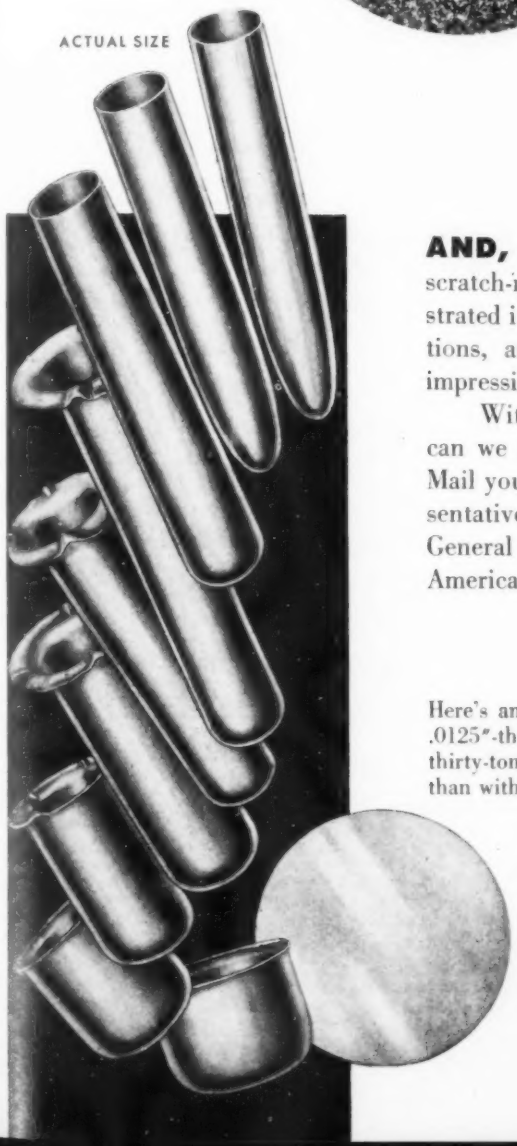
to see the difference

THIS is a 75X magnification of ordinary drawing brass—the kind that's been used for decades for stamped or drawn brass products.



THIS is a 75X magnification of super-fine-grain Formbrite.* Isn't it obvious that this new type of brass can be polished in half the time? Frequently, a simple color buff will bring up the desired finish for lacquering or plating.

ACTUAL SIZE



AND, Formbrite is harder, stronger, springier and more scratch-resistant than ordinary drawing brass, yet has demonstrated its remarkable ductility for forming and drawing operations, and ability to take sharp, clean-cut ornamental die impressions.

With all these advantages, Formbrite costs no more. What can we do to help you try this time and cost-saving metal? Mail you a booklet? Send you a sample? Ask our Sales Representative to call? Simply write to The American Brass Company, General Offices: Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario, Canada.

*Reg. U. S. Pat. Off. 5486

Here's an example of Formbrite at work. These pen caps are made of .0125"-thick Red Brass Formbrite strip at the rate of 2,000 an hour on a thirty-ton, 10-step multiple plunger press. Caps are buffed at a higher rate than with any other metal previously used.

DRAWING BRASS

an ANACONDA® Product

made by The American Brass Company

the staff 'without portfolio'

Industrial processors who choose Microhoning are gaining more than a precision-production method of processing. A single source of responsibility for the complete honing operation . . . including machine, tool, fixture, abrasive, and accessory performance . . . is saving them servicing time and expense.

Microhoning's capacity to remove stock, produce a truly round and straight bore, automatically control size, and develop a consistent functional finish . . . is assured by Micromatic's staff of skilled engineers.

This nationwide group of technicians puts into action its cumulative experience to bring out the full potential of every installation. It is a staff which covers every honing phase in projecting Micromatic's acceptance of undivided responsibility.

In effect, it is the customer's staff 'without portfolio.'

1929 • 1954 — PRECISION PRODUCTION THROUGH MICROHONING — MICROMATIC — 25TH YEAR OF DEVELOPMENT

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
2205 Lee Street
Evanston, Illinois

MICROMATIC HONE CORP.
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Los Angeles 23, California

MICROMATIC HONE LTD.
330 Grand River Avenue
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MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon. • Mason Machinery Tool Co., 415 So. Second East, Salt Lake City, Utah
Tidewater Supply Co., Charlotte 4, N. C.

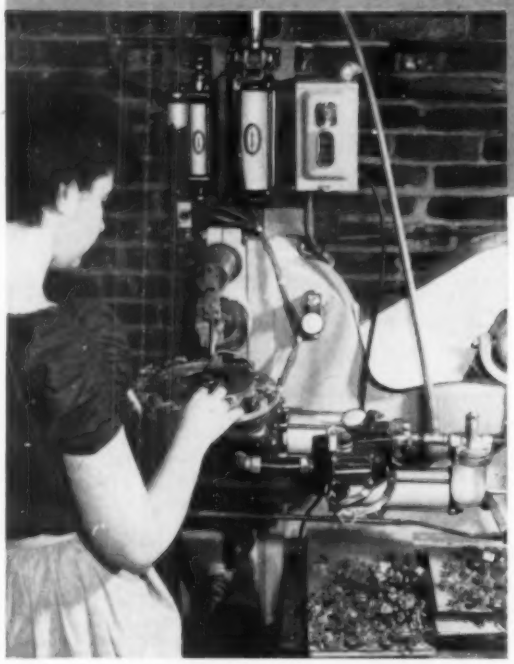
SUBSIDIARY:

Micro-Precision Inc., 2205 Lee Street, Evanston, Illinois

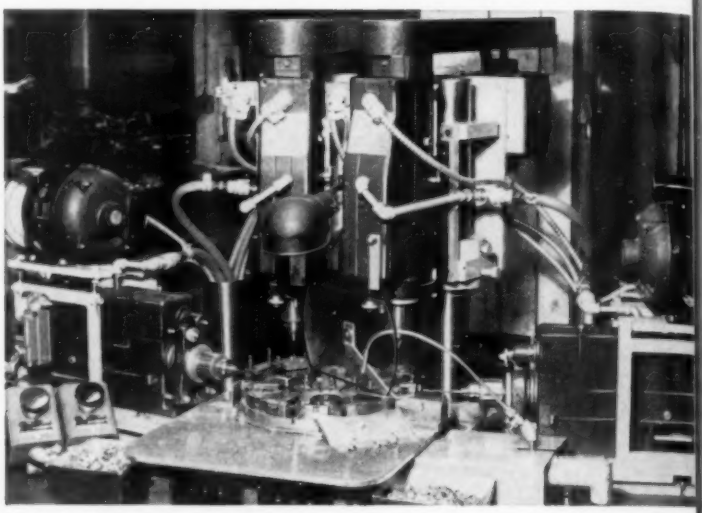
Hydraulic controls • Diesel fuel injection equipment

WITH THIS UNIQUE AIR MOTOR

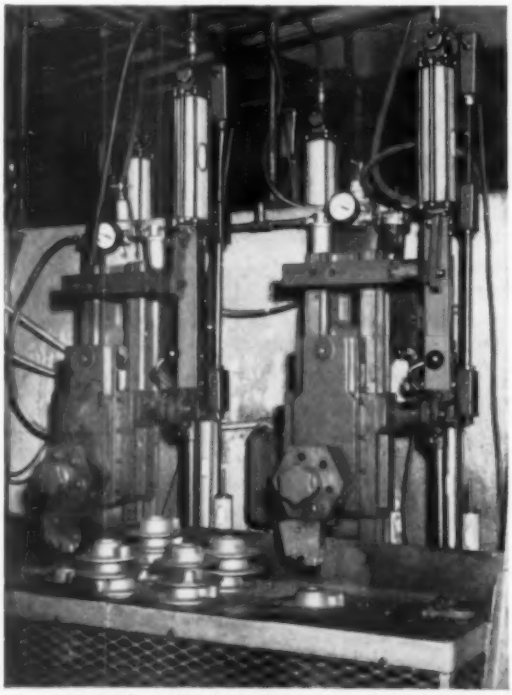
you can build cost-cutting special machines or modernize existing machines right in your own shop with your own personnel



This semi-automatic set-up at Eastman Manufacturing Co. doubled production and eliminated fatigue in milling bakelite magneto parts.



This drilling machine, built by Horrocks-Ibbotson, turned out 1 year's production of their fishing reel pawl blocks in 3 months.



A simple installation cut lathe time on steel ordnance parts from 90 to 10 seconds per piece at Joseph Pickard's Sons of Philadelphia.

Even for short runs you'll find special machines built around this versatile power unit will pay off in a big way — in greatly lowered costs, in fewer rejects, in better product quality. No expensive engineering is needed. In fact, your local Bellows Field Engineer may have in his Foto-Facts File basic designs that can be readily adapted to your product and your production processes.

Your own tool room can build such special machines at decidedly low cost, and quickly. Often they pay for themselves with the first week's savings.

The Bellows Co.

IN CANADA: Bellows Pneumatic Devices of Canada, Ltd.
4972 Dundas St., W., Toronto, Ontario

Bulletin CL-50 tells the story of the Bellows Air Motor and the part it is playing in cutting manufacturing costs in hundreds of plants. Address: The Bellows Co., Dept. TE-554, Akron 9, Ohio.

RECORDING COMPARATOR MODEL R-10

This recorder is designed to record individual readings on production parts. The recording device was designed primarily for use in statistical quality control inspection setups where a permanent record of the pieces inspected could be kept in file as part of the statistical control records of the plant.

Write Dept. T-5 for booklet and additional information

PRODUCTION PRECISION ENGINEERING

MERZ ENGINEERING INC. • 200 S. HARDING ST. • INDIANAPOLIS 7, IND.

WHAT WALES LEADERSHIP THROUGH CONTINUING RESEARCH and DEVELOPMENT *means to you*

1928 WALES *Strippits* revolutionize die making by providing a spring held compressed by a retainer to standardize stripping pressures.

1932 WALES *Self-Contained Hole Punching Units* incorporate the basic Strippit principle to provide free-floating punch and guide for independent design.

1936 WALES *Self-Contained Notching Units* are an outgrowth of the successful applications of Wales Hole Punching Units and Wales Strippits.

1943 WALES *Fabricators* provide rapid interchangeability for punching, notching and nibbling . . . no templates required. Work from prints or operation sheets.

1946 WALES *Drilling Machines* are designed to meet precision requirements of locating, drilling, boring and reaming holes . . . no other drilling machine or jig borer like it.

1951 WALES *Hydra Springs* utilize the compressibility of Wales Comproils to provide up to 600% more pressure than conventional springs.

1952 WALES *Hydra-Strip Hole Punching Units* with built-in Wales Hydra Springs permit these self-contained Units to punch and strip material up to 3/4" thick.

● This chronological array of Wales patented equipment is only a partial list of the numerous exclusive products developed through years of research by Wales Engineers.

That is one of many reasons why thousands of manufacturers have made it a standard practice rule to standardize on Wales developments. You, too, will be years ahead in time-saving, money-saving production techniques by putting Wales Equipment to work in your plant.

To assist you, Wales Sales Engineers are strategically located throughout the country. These engineers are more than just "factory trained" . . . they have been employed by this Corporation for years before servicing prospects and customers.

For further information on how WALES products will modernize your operations, write for illustrated catalogs TODAY.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

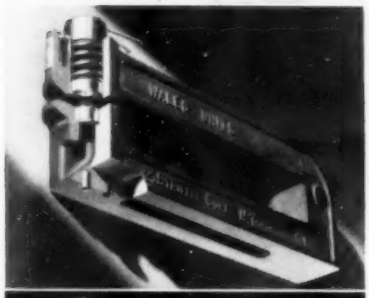
393 **Payne Avenue, North Tonawanda, N. Y.**

(Between Buffalo and Niagara Falls)

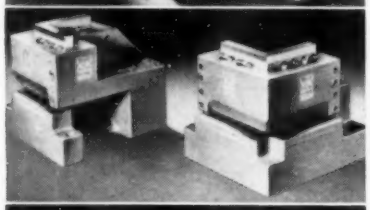
Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

1928

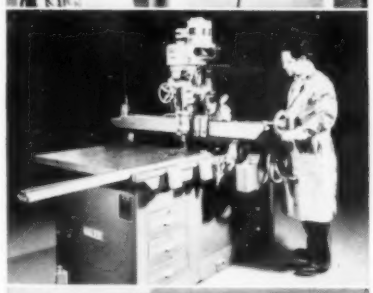


1932



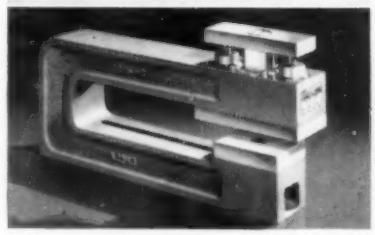
1936

1943



1946

1951



1952

195–

LO-JET ACRO

Now! the new improved mist cooling system!

the revolutionary new coolant system that keeps cutting tools and work at below room temperatures... prolongs tool life, cuts tool breakage loss... saves money...speeds production...keeps work clean...protects operators and is fireproof!

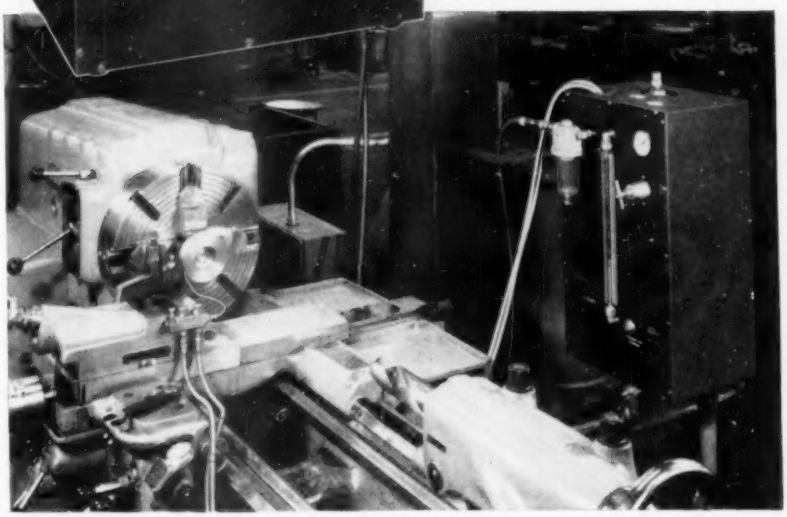
More efficient and adaptable—with separately controlled multiple spray heads. One nozzle can produce a true fog spray while another gives a liquid stream.

Easier to regulate—master panel control now makes every adjustment simpler, much more accurate. Spraymix control, attached by flexible tubes to top of unit, makes for easy positioning and precise, constant spray control.

More compact—all controls, regulators, gauges are **in one place,** at the operator's fingertips.

Smarter looking—a single neat, green wrinkle-finish case houses all mechanisms and controls. The new design eliminates excess piping.

Portable or stationary—mounting permits 'round-the-plant portability, and sturdy bracket mounting also provides for permanent one-location use. Both mountings come with unit.



LO-JET ACRO

there's a Lo-Jet Acro system for every purpose, every machine—write now for details!

AIR CONVERSION RESEARCH CORPORATION
4107 NORTH DAMEN AVENUE
CHICAGO 18, ILLINOIS

Air Conversion Research Corporation TE-5
4107 N. Damen Avenue, Chicago 18, Ill.

Gentlemen: Please send me full information about the new Lo-Jet Acro mist cooling system.

name and title_____
firm_____
address_____
city and zone_____ state_____

SAME MATERIAL—SAME SPECIFICATIONS

Why did one of these parts cost twice as much to machine?

The answer may well show up in *your* production costs. The surface finish on the part at the left was *controlled*, using a Brush SURFINDICATOR*, to meet specifications. The surface finish on the other part was *guessed at* and the part was overfinished, exceeding specifications. Cost data shows that furnishing a 32 microinch finish, where a 125 microinch finish would be satisfactory, *doubles* the machining cost.

You no longer have to guess at surface roughness and spend needless money in overfinishing. The Brush SURFINDICATOR permits you to measure surface roughness easily and quickly on the production line. Laboratory techniques are not required — your shop personnel can quickly learn to make accurate measurements after brief instruction.

SURFINDICATOR* makes surface measurements easy!

The Brush SURFINDICATOR is easy to use, portable and accurate. It can be set up anywhere in the plant where 115 volts a.c. is available. The operator simply guides the pickup over the part, and reads surface roughness in microinches on the meter.

TRY IT YOURSELF! Write for a copy of this booklet. It describes how surface finish control can reduce your machining costs, increase production capacity and help improve your products. Better yet, ask for a demonstration of the SURFINDICATOR in your plant, by a Brush engineering representative. Send coupon now. Brush representatives are located throughout the U. S. In Canada: A. C. Wickman, Ltd., Toronto. Brush Electronics Co., Cleveland 14, Ohio.

*Trade-Mark

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
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formerly
The Brush Development Co.
Brush Electronics Company
is an operating unit of
Clevite Corporation.

Brush Electronics Company, Dept. BB-5
3405 Perkins Avenue, Cleveland 14, Ohio

☐ Please send free copy of "Surface Finish Control".
☐ Have your nearest representative demonstrate the portable SURFINDICATOR to me.

*Name*_____
*Position*_____
*Company*_____
*Address*_____
*City*_____ *State*_____

Reduce Inspection Costs– with **Flame-Plated*** Plug and Ring Gages

Steel Gages Flame-Plated with Tungsten Carbide:

- **Outwear chrome-plated gages 20-1**
- **Outwear solid sintered tungsten carbide gages 3-1**
- **Have same thermal expansion as gage base metal**
- **Are highly resistant to chipping and breaking**

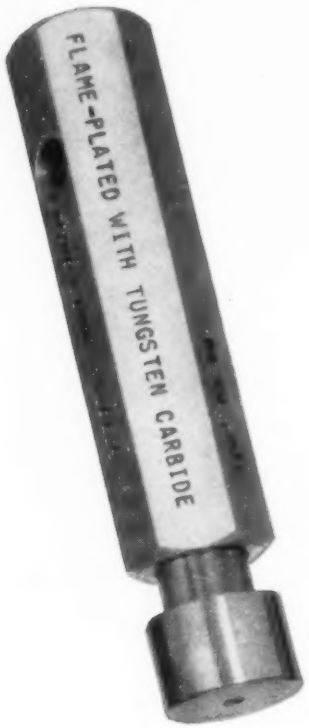
* Flame-Plating is a LINDE process for applying a thin coating of tungsten carbide on the wearing surfaces of gages and hundreds of other parts and tools where high wear-resistant qualities are required.

Cut gage costs to a minimum without sacrificing accuracy. Flame-Plated gages outwear chrome-plated gages 20-1 . . . solid sintered tungsten carbide gages 3-1! Because Flame-Plated steel gages have the same coefficient of thermal expansion as the steel blank, temperature compensation problems are minimized. Flame-Plated gages have a higher resistance to mechanical shock than solid carbide gages.

Flame-Plated plug gages are available in all standard AGD sizes from .059 inch up . . . ring gages from .240 inch up.

Ask your leading gage supplier to show you how you can cut inspection costs with Flame-Plated gages—or call your nearest LINDE office.

For the full Flame-Plating story on gages and other applications, send for your free copy of the "Flame-Plating" booklet today. Just clip coupon below.



The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation

LINDE AIR PRODUCTS COMPANY, Room 308A
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

Please send me your free booklet on Flame-Plating, Form 8065

Name.....Position.....

Firm.....

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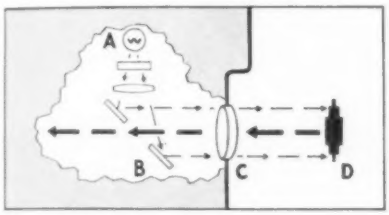
Linde
TRADE-MARK

Plain Pointers on Projection

ONE of the basic precepts of the study of geometrical optics is that the angle of incidence equals the angle of reflection. This law, recognized by the Greek philosophers and refined by later investigators, has an important bearing on modern optical gaging by projection. In numerous instances it is desirable to project the surface of a part on the screen to check the position and size of recesses or to measure features which may not permit conventional profile shadow images. The ease and success with which this is done depend not so much on how much light is thrown on the part as on how much of this light is reflected back into the instrument's lens.

Traditionally, surface illuminators used with contour projectors have been placed at an angle on each side of the lens or optical axis. This was true of the pilot model of the Kodak Contour Projector and we frankly admit it proved somewhat less than perfect. Since the light struck the part at an acute angle, it was reflected from the surface at a similar angle—reflected away from the lens, as it were, when the part was normal to the lens for a distortion-free image.



However, between design of this pilot model and our production models, our optical engineers devised a radically different system. As shown here schematically, this consists of a 1000-watt lamp (A) so mounted that its light is reflected by a mirror (B) through the front lens (C) of the instrument. Since the light from this surface illuminator travels along the axis of the lens, it is reflected from a part (D) back through the lens with negligible loss. By staging the part to be measured perpendicular to the optical axis, the angles of incidence and reflection approach zero degrees. Light is reflected from the part back on its own path.

This permits inspection of deep recesses and results in a screen image of unusual brilliance when projecting surfaces. The latter we have frequently demonstrated by placing the works of a small watch on our contour projector. Spectators are generally impressed to see the wheels and gears in motion, and on at least one occasion we've had a watch brought to us for repair. While this was perhaps somewhat embarassing, we're reconciled by the thought that users of our projectors are saved embarrassment daily because of the accuracy with which they can gage parts to "tenths."

ATRAX IN ACTION

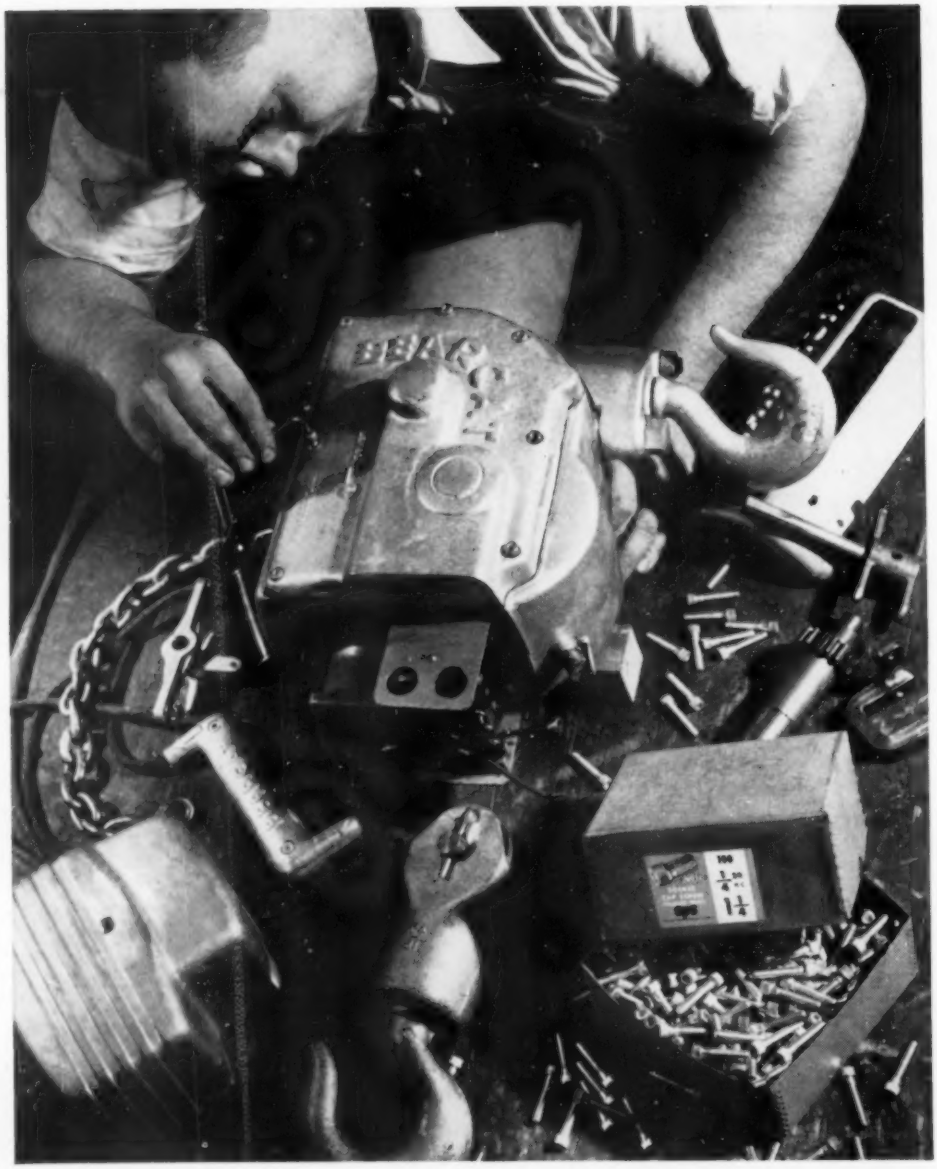
$3,000 SAVINGS IN LABOR WITH $100 WORTH OF CARBIDE BURS

A CASE HISTORY: One of our customers had an extremely difficult problem of burring some piece parts after assembly. After consultation with Atrax engineers, it was determined that Solid Carbide Burs were the only type that could be used to salvage this huge job. Six Carbide Burs were bought for this job, totalling approximately $100.00. They saved the company over $3,000.00 in labor. Besides this, they made possible salvage of very valuable piece parts for a very nominal original investment.

Possibly our engineers or sales representatives can help YOU achieve similar savings. You'll find them in all principal cities, ready to consult without any obligation.

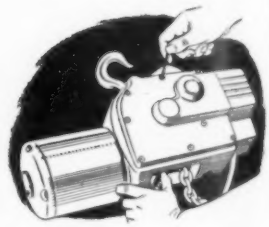
NEW! Complete 88-page Manual and Catalog of Carbide Tools. Write for your free copy.

THE ATRAX COMPANY NEWINGTON 11, CONNECTICUT



23 UNBRAKO Socket Head Cap Screws are used to assemble this lightweight, high efficiency electric hoist. They were selected for their uniform accuracy and high tensile strength.

The knurling on the head of UNBRAKO Socket Head Cap Screws permits faster assembly, because of the positive slip-proof grip.



The uniform depth and size of the hex socket assure strength and maximum torque in wrenching—extremely important in the cap screws used to fasten assemblies like this.

UNBRAKOs—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. In standard sizes from # 4 to 1".

Save time and money by using UNBRAKO Standards...stocked by your distributor

You'll have less money tied up in inventory, you'll need less space for storage, you'll get personalized service and faster deliveries. And you'll be buying the finest socket screw products that modern machines, complete facilities and quality control can produce. Write for UNBRAKO Standards, a complete listing of socket screw products made by the world's largest producer. STANDARD PRESSED STEEL Co., Jenkintown 37, Pa.

UNBRAKO® **SOCKET SCREW DIVISION** SPS JENKINTOWN PENNSYLVANIA

ASK **BAIRD** ABOUT IT!

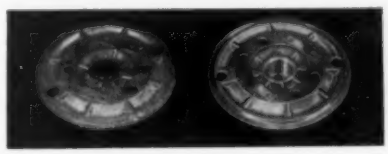
HIGH PRODUCTION TOOLING

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

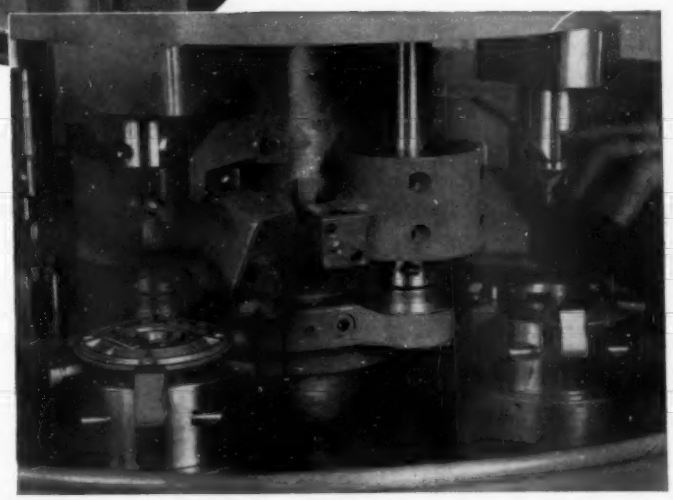
. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER



(Above) Front view, showing splash guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.

FEATURES BAIRD 4-SPINDLE VERTICAL LATHE

1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
6. Outstanding production records.

Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

Through specialization, Card is better prepared to fulfill your most exacting threading requirements.

TAPS *by* CARD

The CARD Quality

Completely stocked offices at ***Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco*** *and* ***Seattle***

See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO TAPS • DIES • SCREW PLATES

Which is the CleCap?

...the outsize one that nobody else makes

One of the advantages CleCap customers enjoy is the knowledge that when they want some of those BIG cap screws, the chances are 9 out of 10 we can ship them the same day.

CLEVELAND *Top Quality* FASTENERS

Ferrous and Non-Ferrous

Hex Head Cap Screws—Bright and High Carbon Heat Treated Steel, Brass, Silicon Bronze, Stainless Steel; ¼" to 2½" dia.
Socket Head Cap and Set Screws—Plain and Knurled ¼" to 1½" dia. Also Flat and Button Head Styles.
Flat Head Cap Screws: ¼" to 1" dia.
Fillister Head: ¼" to 1¼" dia.
Set Screws—Square Head: ¼" to 1½" dia.
Milled Studs: ¼" to 1¼" dia.
Place Bolts: ¼" to 1½".
Structural Bolts to ASTM Specification A325
Tractor Bolts
Special Hot and Cold Headed Parts

Facilities to make larger diameters than listed.

CleCap makes 'em from ¼" to 2½" diameters, any length you want—ferrous and non-ferrous—and we stock a lot of unusual sizes, nearly 10,000 different items last count.

That's another reason for dealing with *The* cap screw specialists of the country. You also get unbeatable top-quality fasteners . . . PLUS a CleCap crew that has a long-made rep for "busting a leg" to get you what you want exactly when you want it.

What happens to your profits when late deliveries hold up production lines? Put your cap screw needs up to CleCap . . . and relax!

Ask Your Jobber for CleCap!

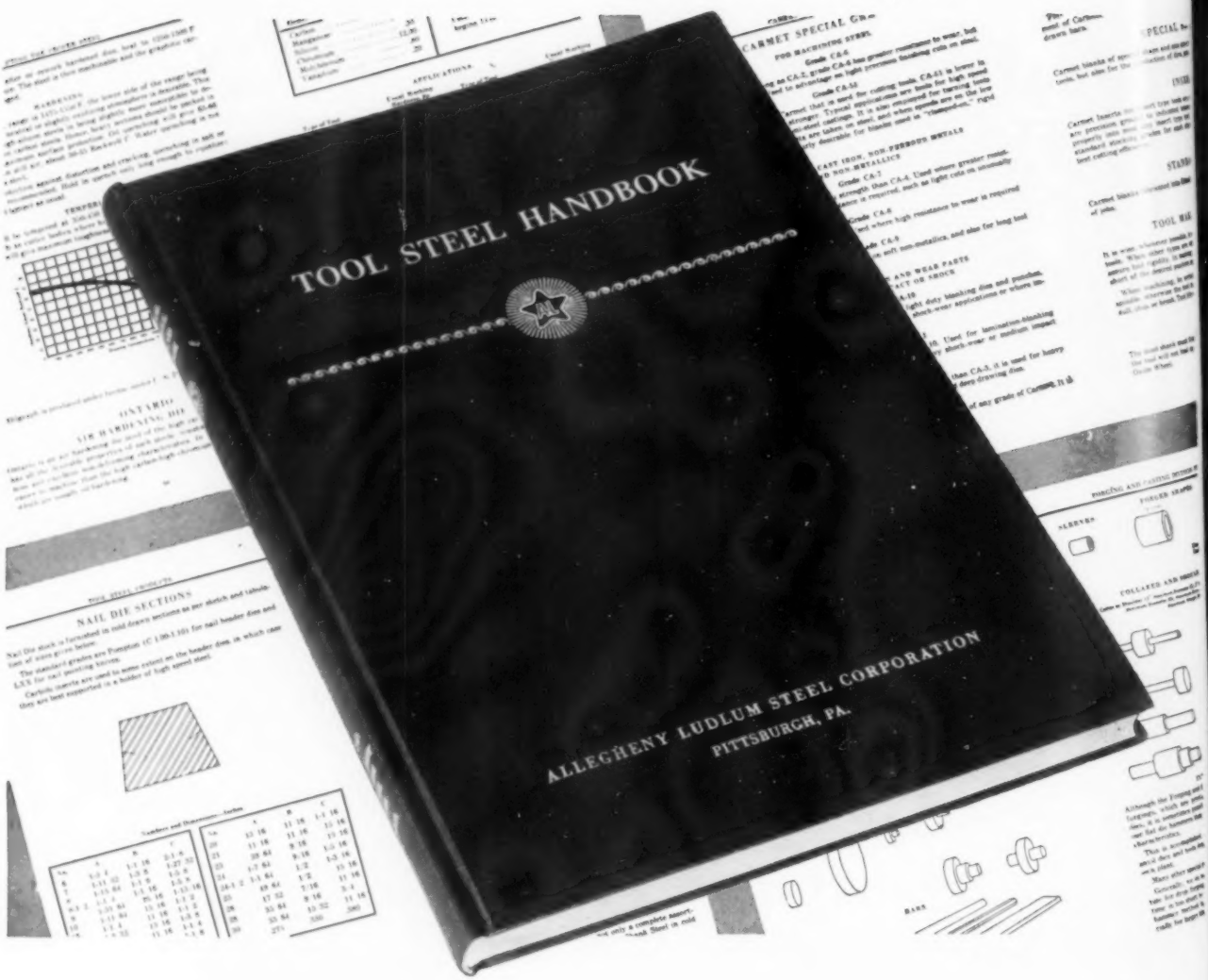
The Cleveland Cap Screw Co.

2944 EAST 79th STREET • CLEVELAND 4, OHIO

VUlcan 3-3700 TWX CV42

Warehouses: Chicago • Philadelphia • New York • Providence • Los Angeles

Originators of the Kaufman DOUBLE EXTRUSION Process



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Your copy of the Tool Steel Handbook will be sent—*without charge*—upon request. Our only stipulation: please make your request upon your company letterhead. ● Write to *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pennsylvania.*

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AL FINE TOOL STEELS SINCE 1854

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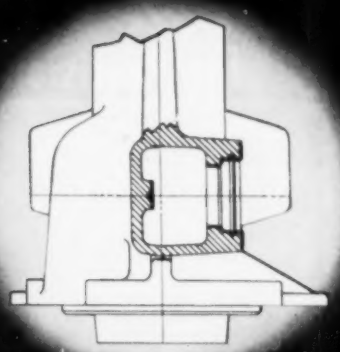

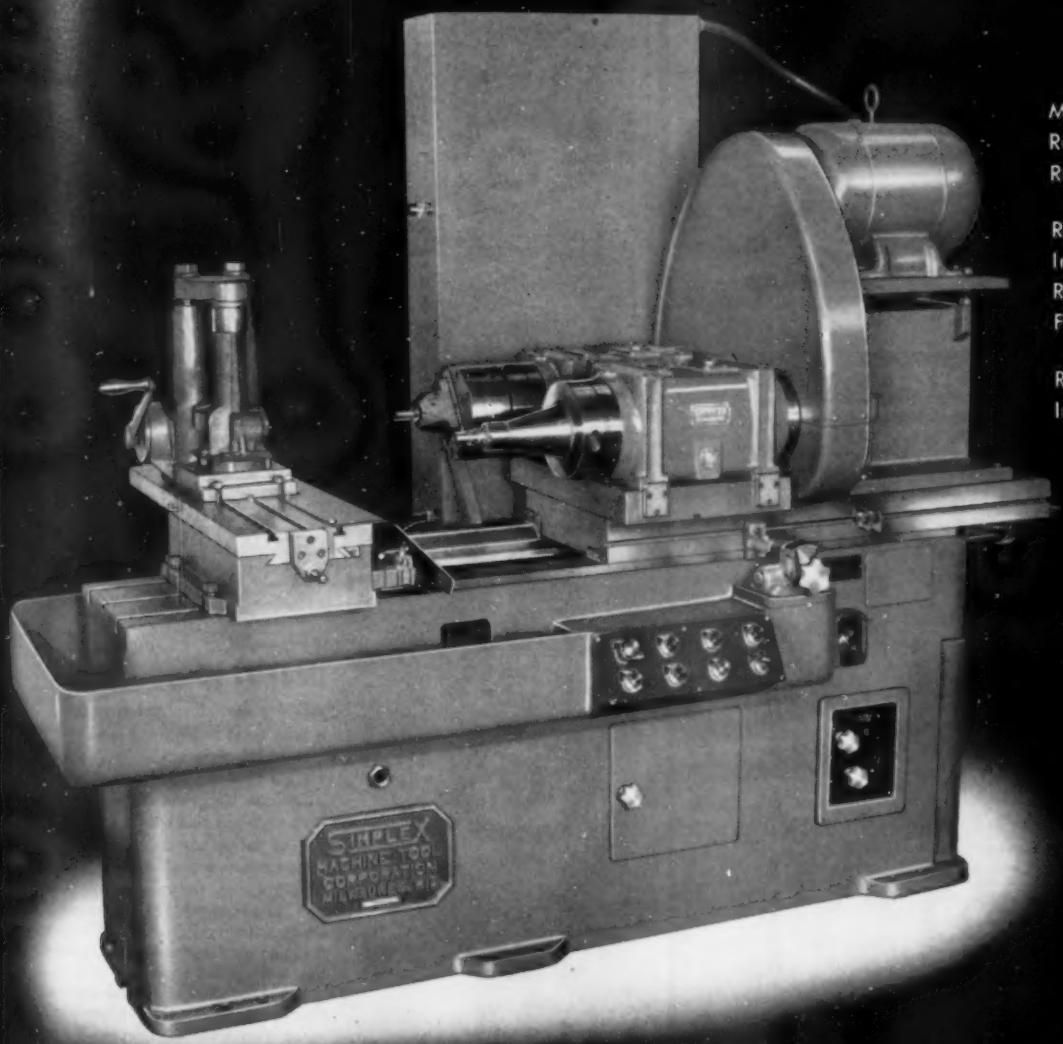

Machine Cycle
Rapid Advance
Rough Bore with Front Head
Rapid Return
Index Cross Slide
Rapid Advance
Finish Bore, Face and Groove
Rapid Return
Index Cross Slide

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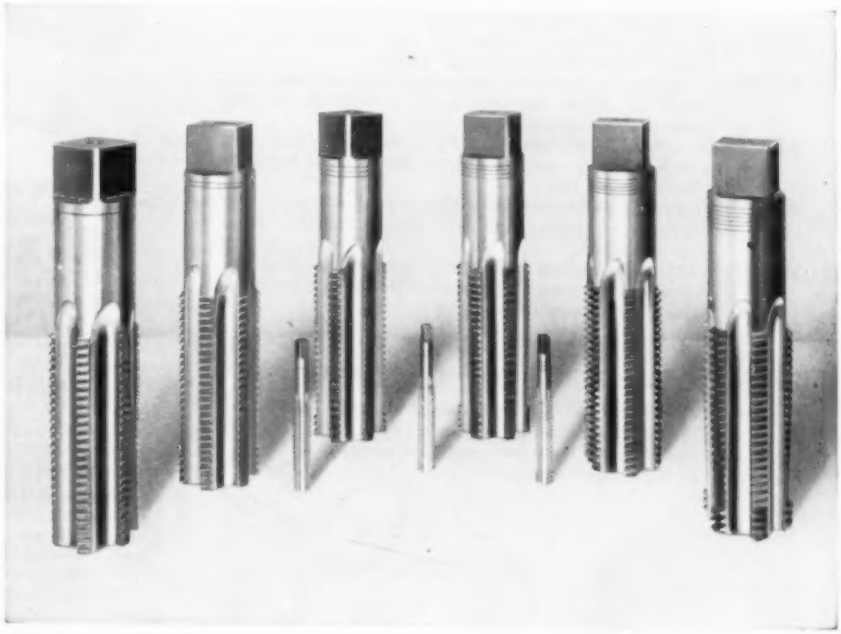

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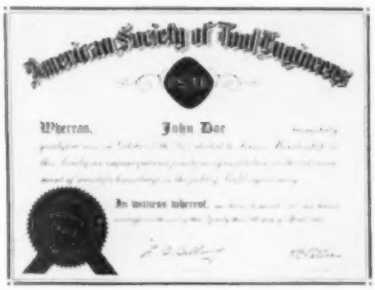

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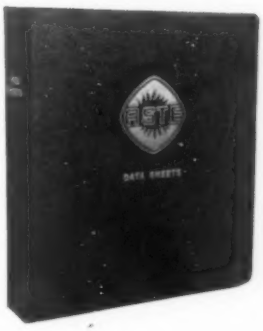

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May, 1954, Issue

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Balas "CT" Collet

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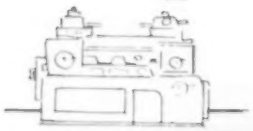

Martin Master Collet

Balas MASTER COLLETS

Save time on set-ups
Save money on tooling

THE BALAS LINE INCLUDES

- Master Collets and Pads
- Pushers and Feed Fingers
- Master Pushers and Pads
- Ejector Collets
- Collet Sleeves and Chuck Nuts for B.&S. Machines
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You reduce set-up time when you use Balas Master Collets because they are front loading ... the pads are easily and quickly changed without disturbing the setting of the collet. "Cam grinding" on the taper provides faster opening and closing ... tighter gripping and consistently accurate production.

You can save money and take advantage of the full capacity of your machines by using the proper Balas Master Collets and matched sets of pads to accommodate various sizes of stock. The specially selected alloy steel used in Balas Collets ... their precision manufacturing, careful heat treating and rigid inspection makes them produce better ... last longer.

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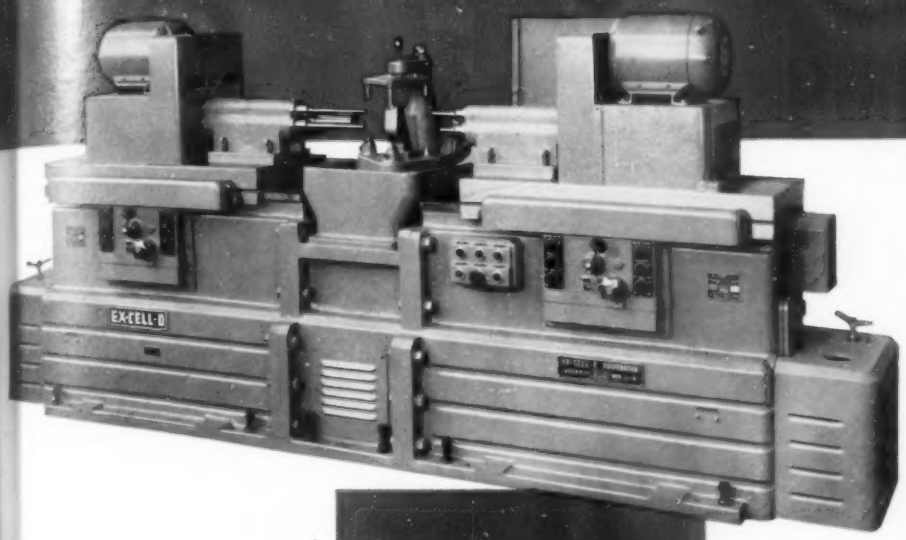
lodernize Today for Profits Tomorrow

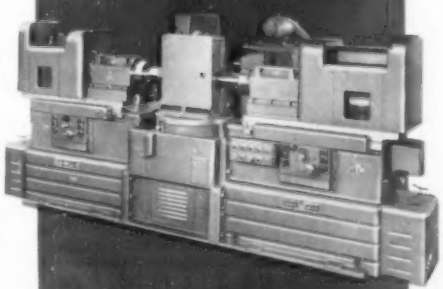
ITH FAST, VERSATILE PRECISION WAY MACHINES



STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

STYLE 54 ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.



STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.

STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

EX-CELL-O

WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

EX-CELL-O
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DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
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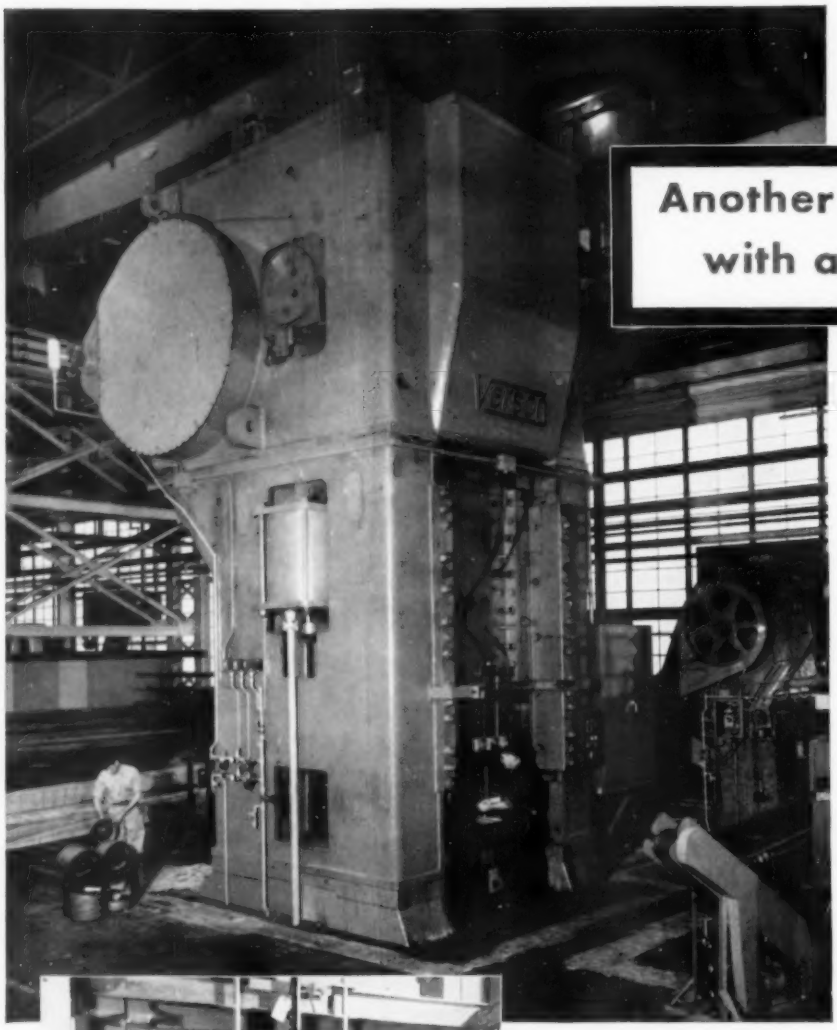
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO

54-3



Another job done better with a Verson press

THIS Verson 2500 TON FULL ECCENTRIC PRESS forms automotive flywheels

Close-up of the die space in this 2500 ton Verson Full Eccentric Press showing the part being formed.

If you want to combine the highest standards of accuracy and uniformity in stampings with long, dependable, trouble-free press life, a Verson Full Eccentric Press is the answer. Verson Full Eccentrics incorporate the sum of over thirty years' experience in the manufacture of rugged high strength presses designed to produce better stampings at lower cost.

Such features as the Verson Allsteel Frame . . . the Verson full eccentric drive . . . straight thrust eccentric strap . . . extra long, barrel type, non-oscillating vertical adjusting screw . . . anti-overlap clutch and brake unit put Verson Full Eccentrics in a quality class by themselves.

The press shown above is typical of Verson Full Eccentric Presses. It is being used to form heavy flywheels on a high production basis. Note the long, extra heavy special gibbing and rugged construction throughout—assurance of the accuracy and uniformity required in a part like this.

The Verson Full Eccentric line includes models with one, two and four point suspension in capacities from 100 tons up. Further data is given in Catalog G-52. Write for your copy.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

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